Mach3 USB Motion Card (AKZ250) Installation Manual

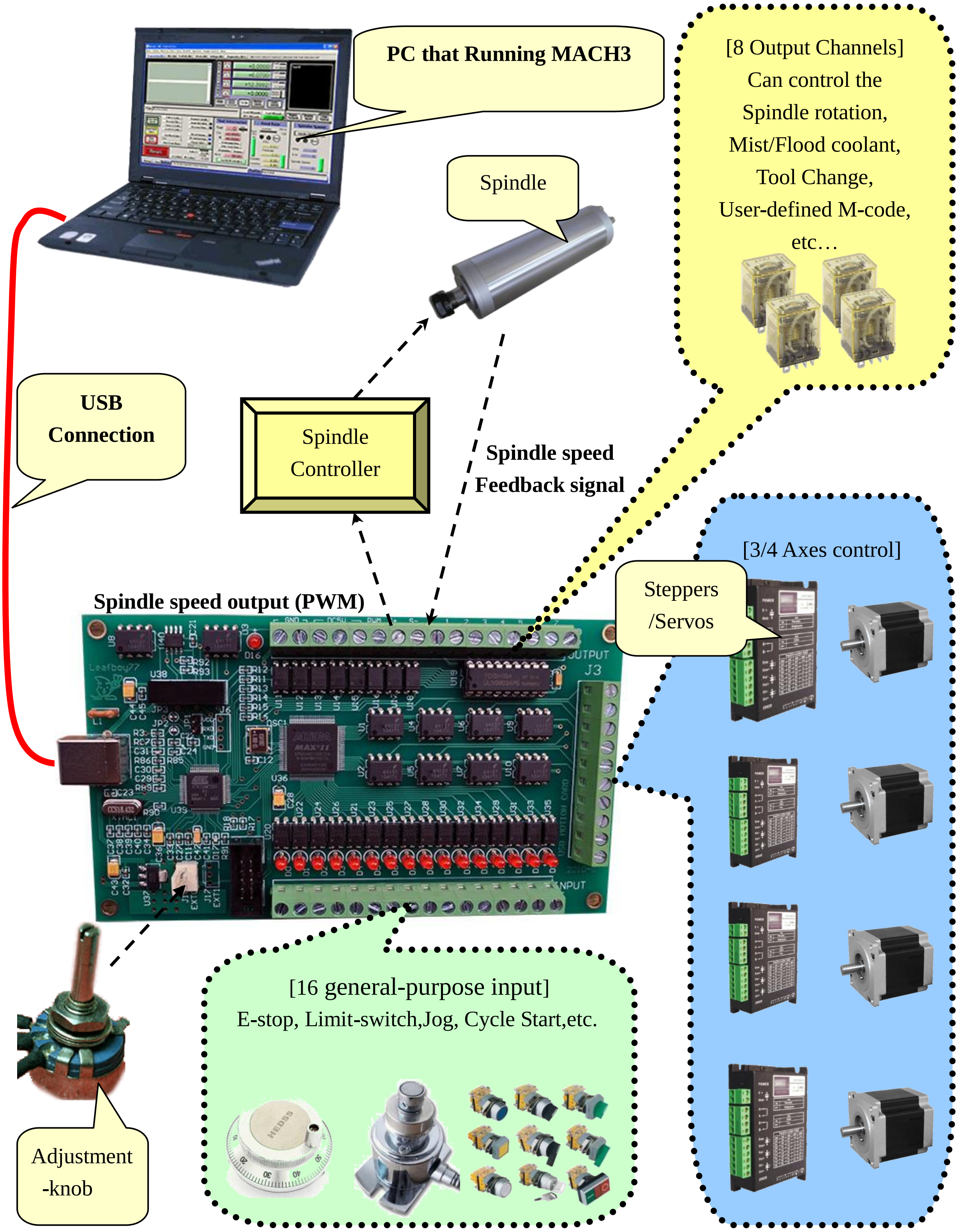
Ver1.17 (Date of document updates:**2012/11/2**)

Features:

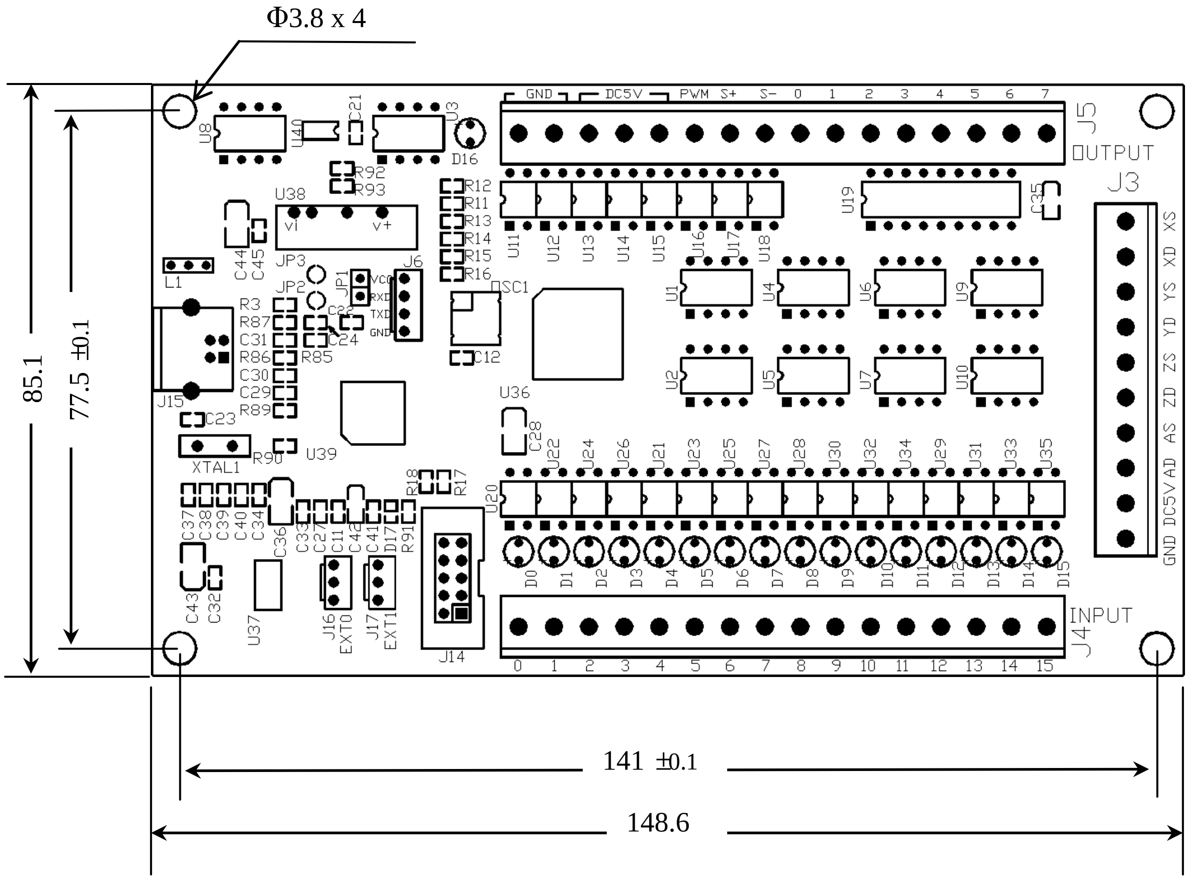
- ✧ Supports all Mach3 versions, including the Mach3 R3.042.040 version.
- ✧ Supporting Windows series, including Windows2000/XP/Vista/Windows7.
- ✧ No need to install any USB drivers,it can be used aftr plugging in the computer.
- ✧ Full support for USB hot-swappable, the card is Monitoring USB connection status at any time.
- ✧ Supports Mach3 software limitationand backlash functions. .
- ✧ Maximum step-pulse frequency is 200KHz, which is suitable for the servo or stepping motor.
- ✧ Status indicator LED can be useful to show the USB connection, and working status by flashing.
- ✧ 16 general-purpose inputs, with indicators.
- ✧ Feed rate, spindle speed rate, or jog rate can by controlled by the adjustment-knob.
- ✧ With on-board isolated power supply, external power supply is not needed. External power can also be supplied to reduce USB load. .
- ✧ 10 high-speed optocouplers with 10MHz, 24 general optocouplers for isolating all of the input/ output signals, this high-cost design can be provided high performance and stable system.
- ✧ Real-time speed chart and spindle speed changes can be observed

Contents

Basic connection diagram (an Overview)



Mechanical dimensions diagram



1. Prepare

1.1 Prepare Mach3 software

The latest version of Mach3 official website:
http://www.machsupport.com/downloads.php

Mach3 download: as shown below:



Downloads

For previous versions of Mach and LazyCam, XML's, and other Extra Information: Click Here

(Some of the older files are linked directly from the FTP server in order to avoid redundancy. If your download does not start immediately, please give it a few seconds - it's probably trying to contact/login to the FTP server.)

Mach

Mach3 is the flagship of the ArtSoft products. It is released in two versions: a Lockdown version, and a Development version. The Lockdown is a stable, static release recommended for new users, or people trialing the software. The Development version contains developing features and is released quite often so people can obtain new (but untested) features and capabilities. Both releases are limited to 500 lines of Gcode until licensed. Mach3 has a limit of 10,000,000 lines of Gcode even after licensing.

You must use a Desktop PC running a 32-bit version of Windows if you are using the Mach3 Parallel Port Driver. Laptops are not supported because the power saving features of the chipsets disrupt the pulse stream. Mach3 will only be supported on laptops running an external motion controller, such as one of those found on the Plugins page.

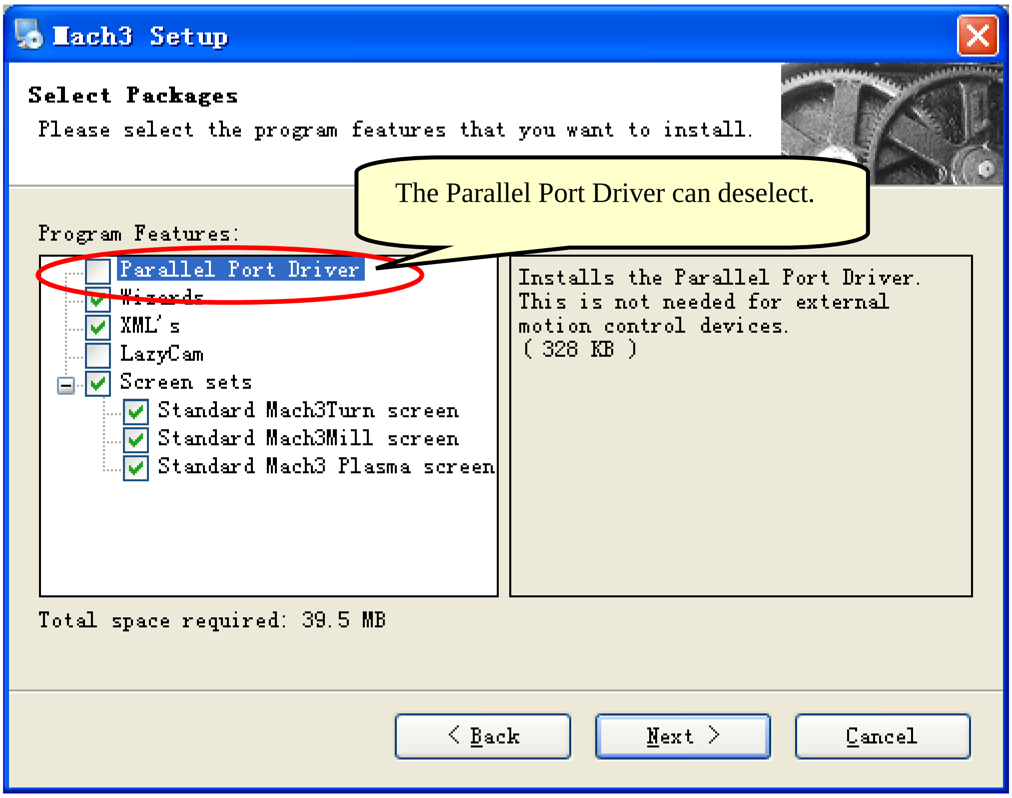
Lockdown:

Mach3 R3.042.040

Mach3 Changelog

Install Mach3:

This card does not require the parallel port driver.



1.2 USB cable Prepare

Magnet ring installed in the USB cable at both ends



Attention

Use of acceptable quality USB cable

1.3 Installation the software of the USB motion card

This USB motion card does not need install any USB driver，Windows2000/Xp/Vista/Windows7 can directly identify.

1.3.1 Connecting the USB cable to the PC and the motion card.

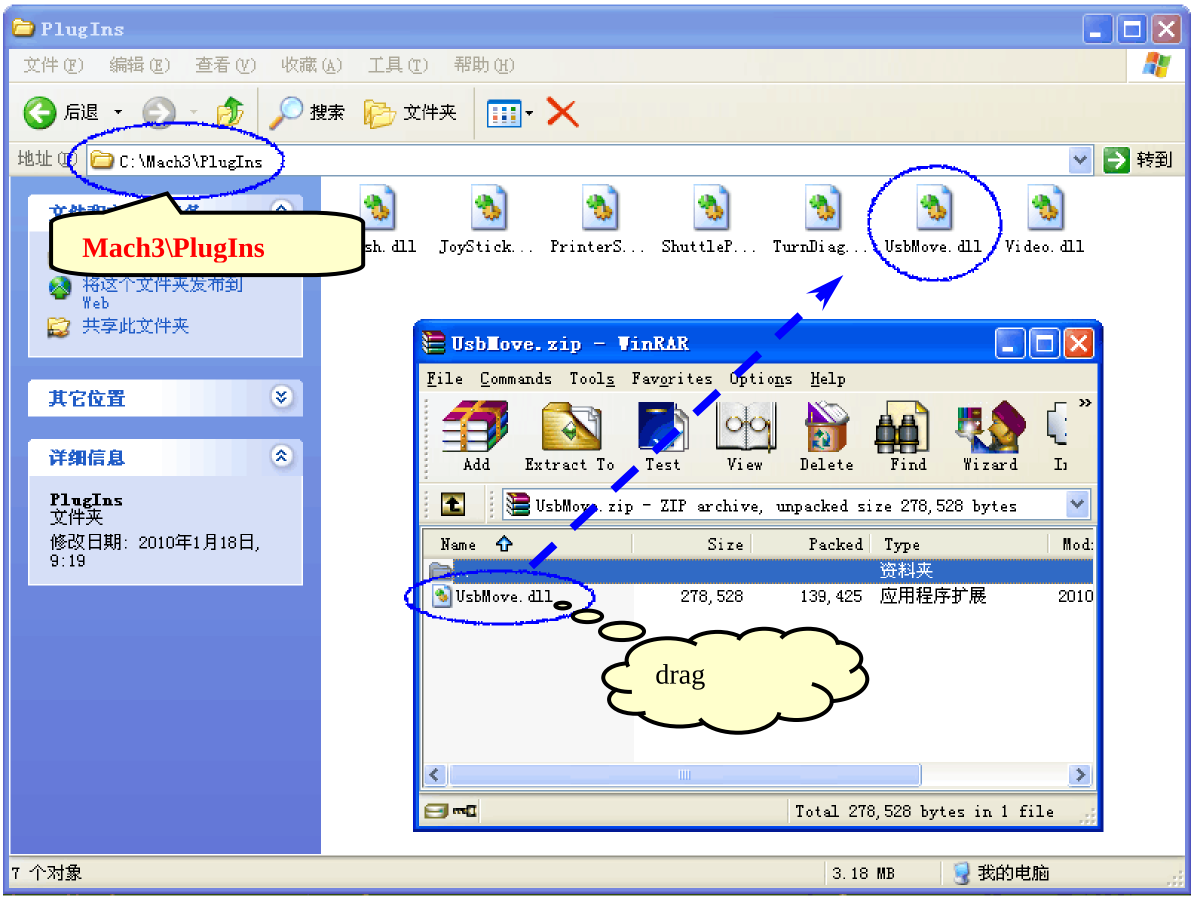




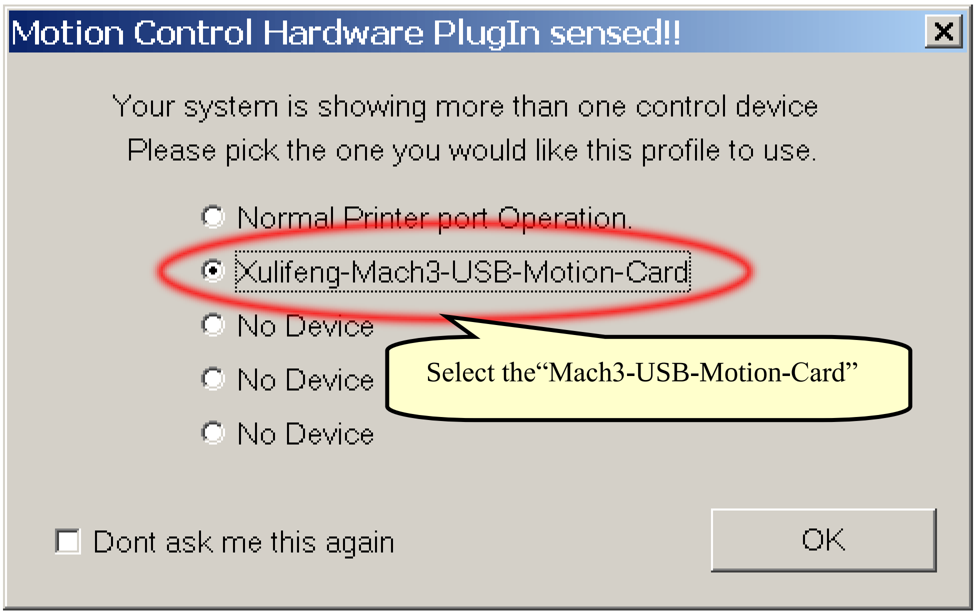
When the status indicator (LED) lights on the card, USB connection is successful.

1.3.2 Unzip the usbmove.zip, copy or drag usbmove.dll into your Mach3\PlugIns folder.

Note: Download the latest version of plug-in(usbmove.zip) in



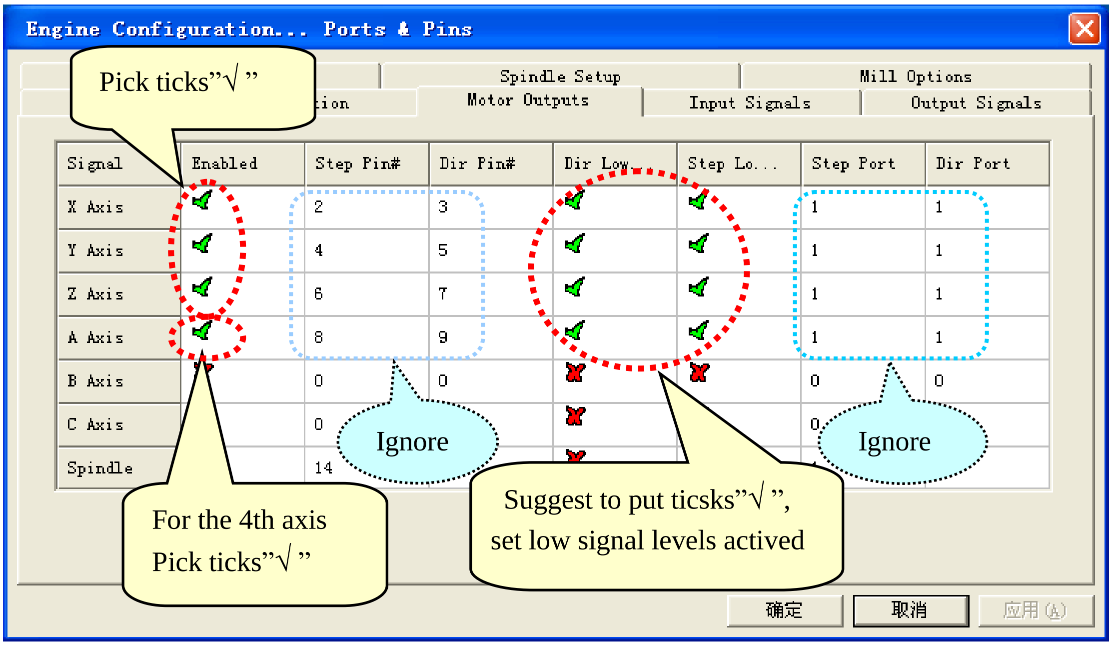
1.3.3 Start the Mach3 software, a dialogueof “Motion Control Hardware PlugIn sensed!!”is shown. Please select the “Mach3-USB-Motion-Card”, you can also check”Don't ask me this again”.



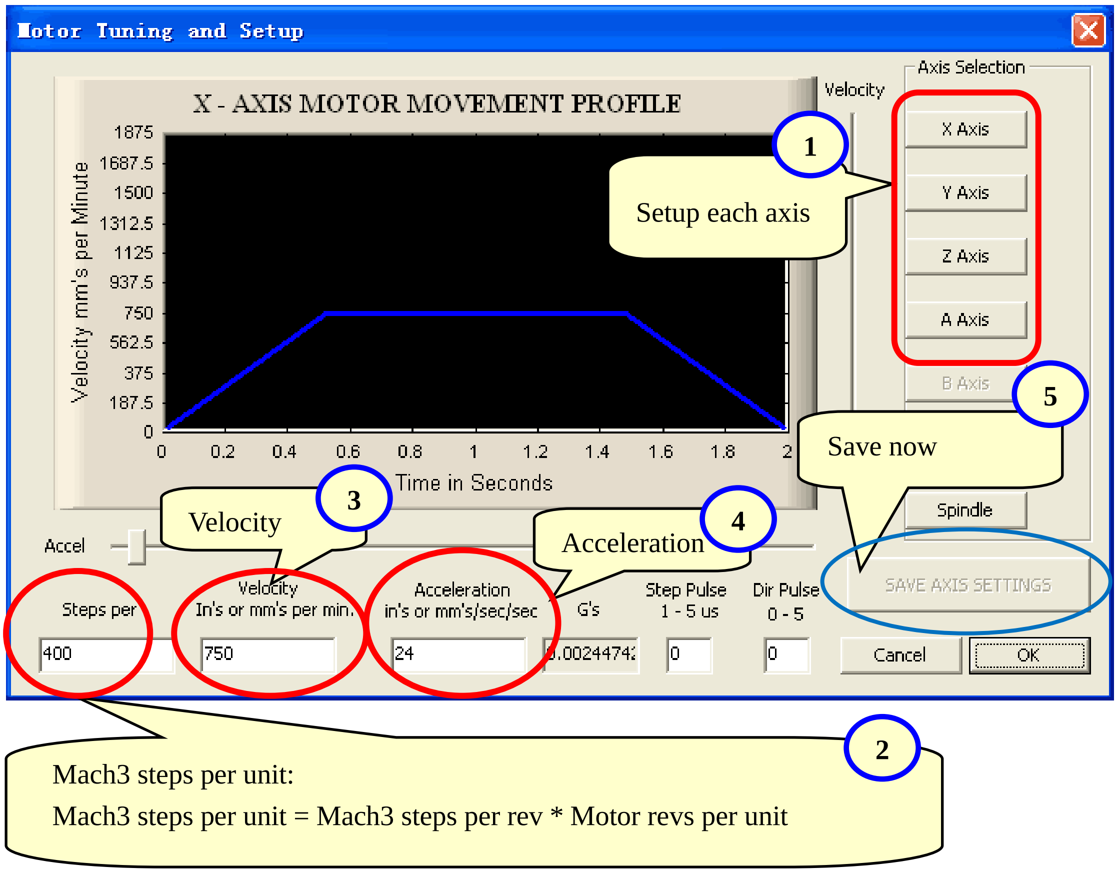
When the Mach3 is connecting with the card, the Status indicator (LED on the card) is flashing.

2. Setup for Mach3

2.1 Mach3 X、Y、Z、A Axis config as shown below: (Config => Ports and Pins)

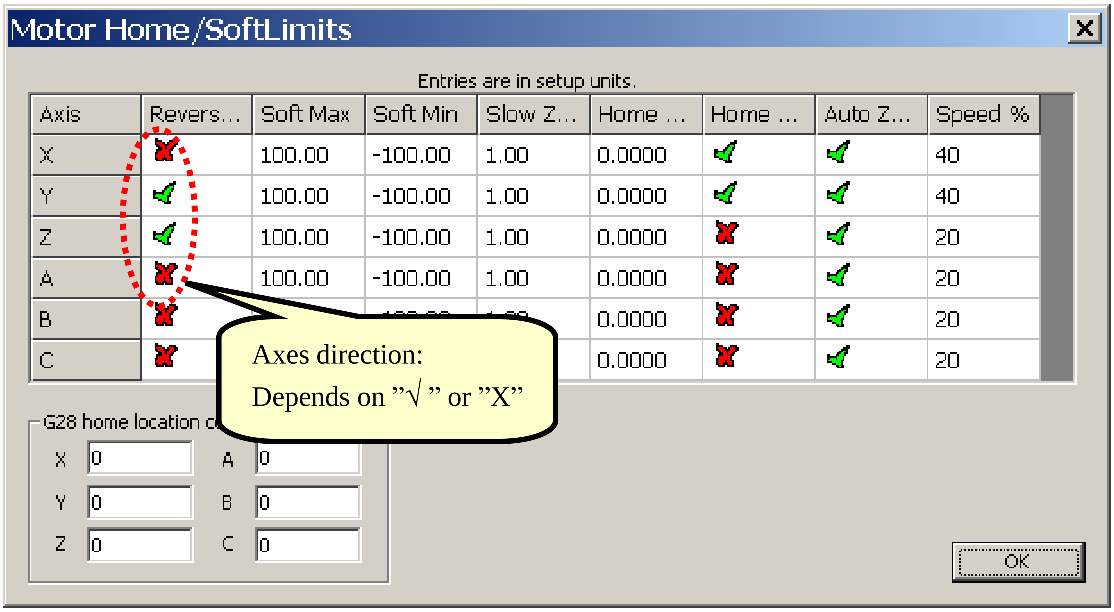


2.2 Motor tuning setup as shown below: (Config => Motor Tuning)



2.3 The Mach3 Menu => Config => Homing/Limits dialog

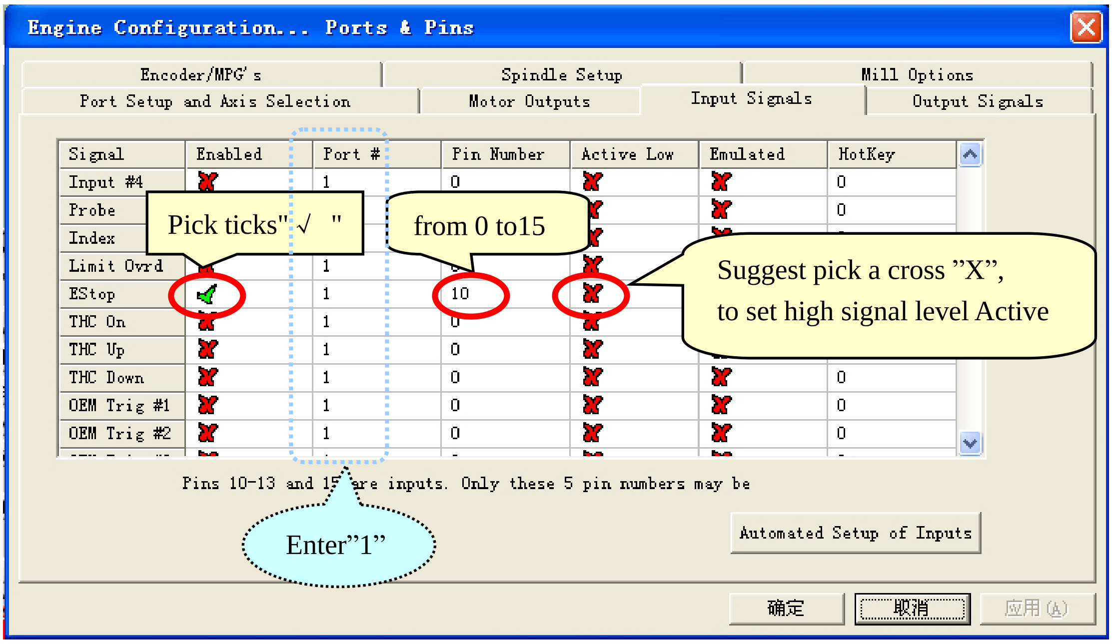
Axes direction, depends on the “Reversed”.



2.4 Setup the input singles.

There are 16 general-purpose input channels. The channels number is from 0 to 15(at J4).

Suggest Active Low =”X” (Set High signal Level for Inputs)

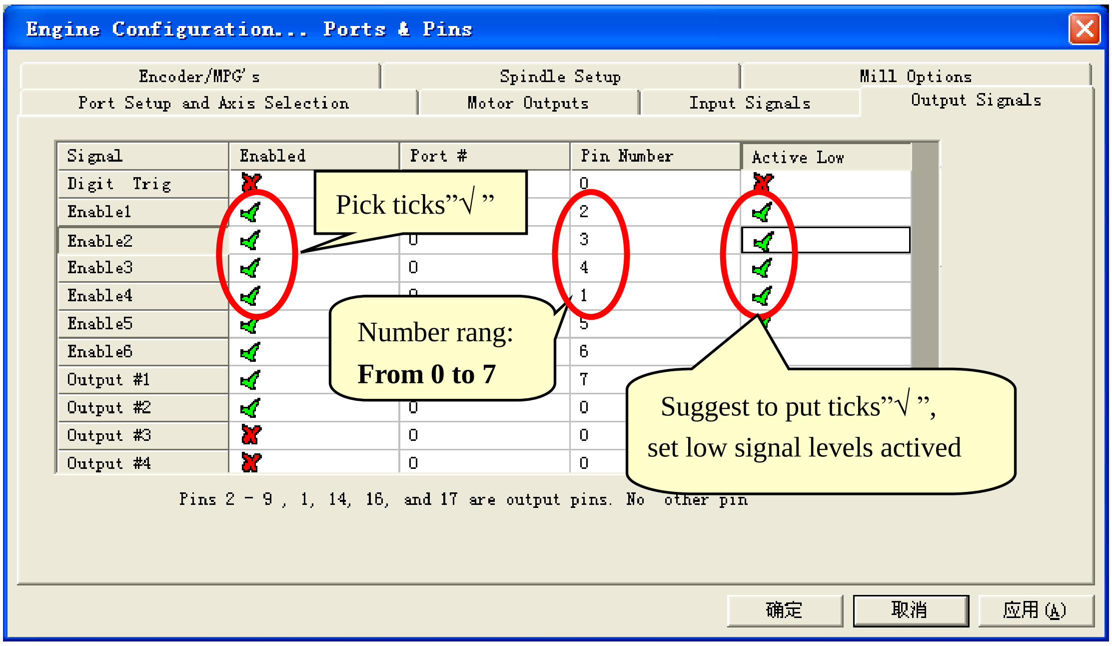


2.5 Setup the Output signals.

There are 8 general-purpose (open-drain) output channels,

The channels number is from 0 to 7 (at J5).

Suggest Active Low =” √” (Set Low signal Level for outputs)



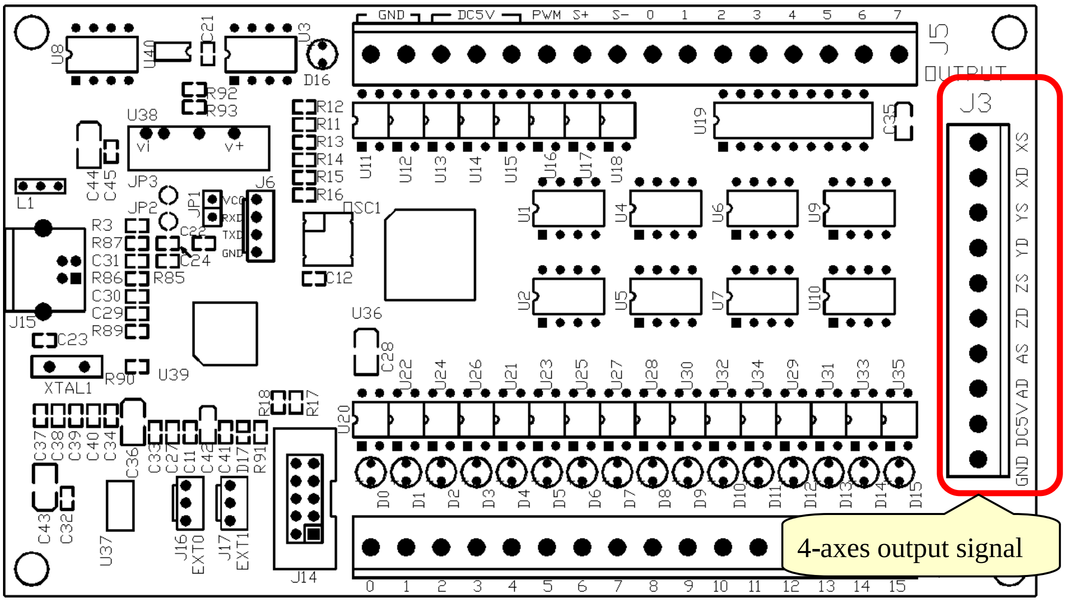
3. Setup motion card Hardware

The board is used USB power source, with isolated power source module, external power supply is not requested.

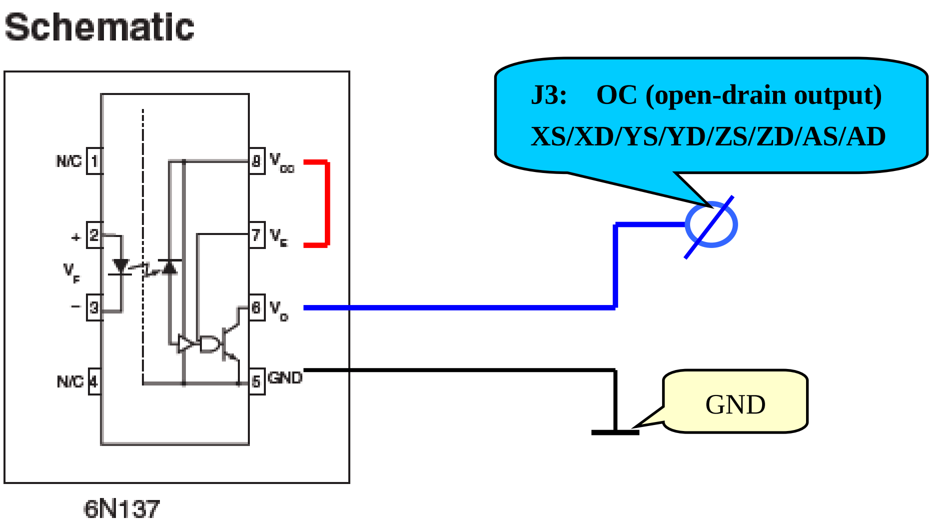
All outputs, including 4 axes pulse/DIR/8 output controls/Spindle-speed PWM output, are set to be high-impedancestate (Hi-Z) when USB is connected. When running Mach3, Level is controlled by Mach3.

Suggest: All output signals in Mach3 can be set to be Active Low.

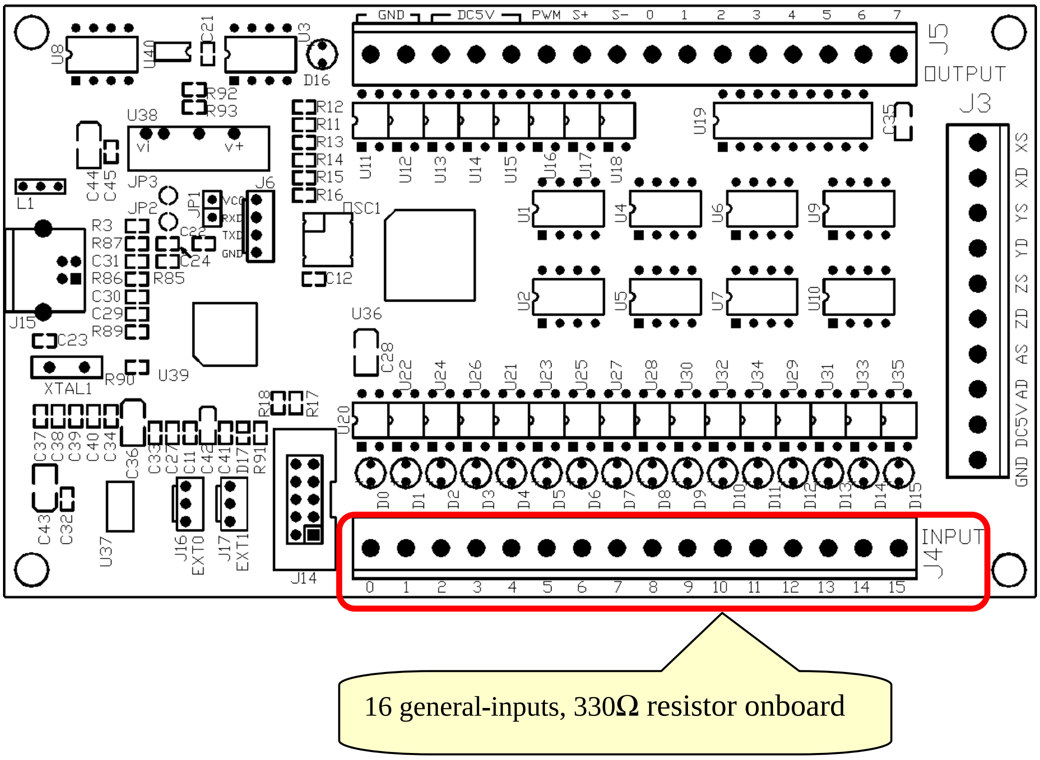
3.1 4 axis output signals, please refer to J3signals indicating.



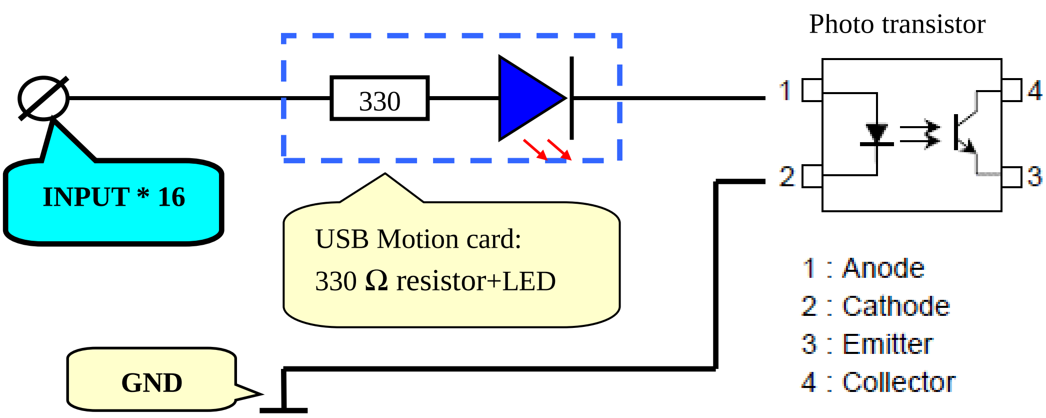
4-axes and Spindle PWM outputs



3.2 16 general-inputs, input valtage 5V(current:7mA). Wired on J4.

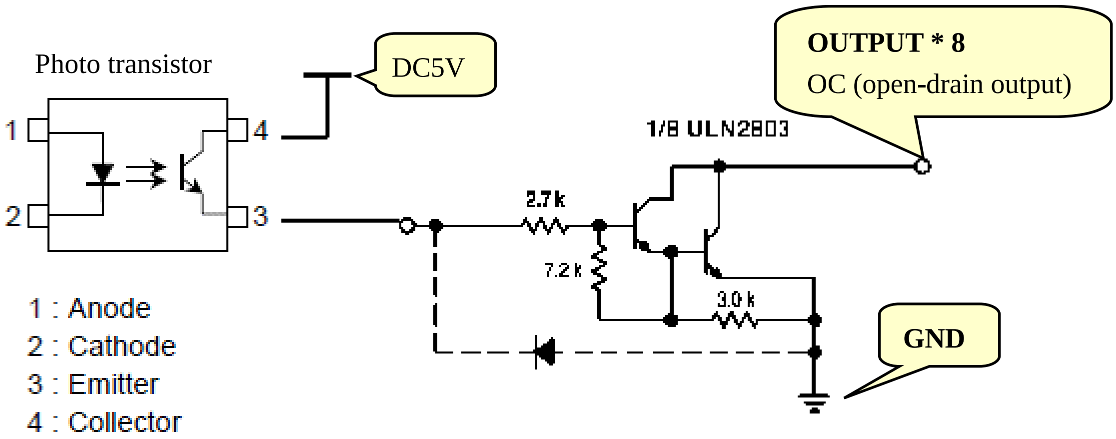


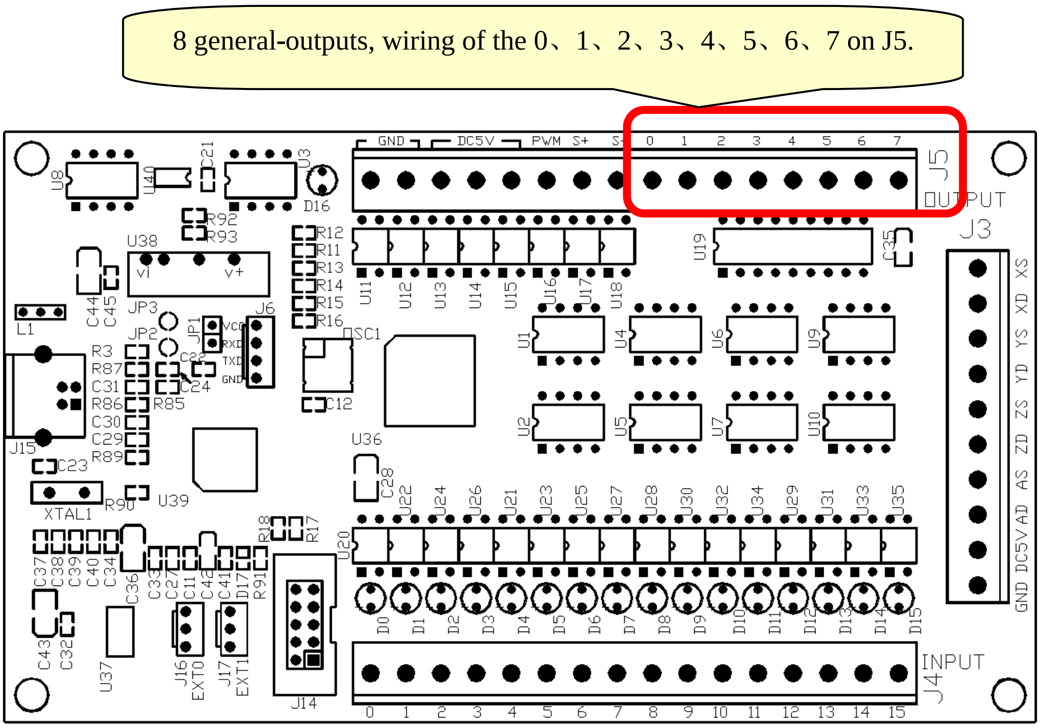
16-general-inputs Schematic



3.3 8 general-outputs, wiring of the **0、1、2、3、4、5、6、7 on J5.**

Maximum Load voltage=24V / current=500mA, When output Low (turn on), otherwise the output is high-impedancestate (Hi-Z).





4 Motion card connection Table

4.1 4-axes

J3

GND	DC5V	AD	AS	ZD	ZS	YD	YS	XD	XS

Pin Name	Function	Electrical	Description
GND	GND	GND	Signal Ground
DC5V	5V DC Output	Max=120mA	On-board isolated power module output
AD	A Direction	OC，12V/13mA	A axis Direction Signal
AS	A Stepping	OC，12V/13mA	A axis Stepping (Pulse) Signal
ZD	Z Direction	OC，12V/13mA	Z axis Direction Signal
ZS	Z Stepping	OC，12V/13mA	Z axis Stepping (Pulse) Signal
YD	Y Direction	OC，12V/13mA	Y axis Direction Signal
YS	Y Stepping	OC，12V/13mA	Y axis Stepping (Pulse) Signal
XD	X Direction	OC，12V/13mA	X axis Direction Signal
XS	X Stepping	OC，12V/13mA	X axis Stepping (Pulse) Signal

4.2 16-Inputs

J4

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

<table>
<tr><th>Pin number</th><th>Function</th><th>Electrical</th><th>Description</th></tr>
<tr><td>0</td><td rowspan="2">General-purpose Input / MPG Input</td><td rowspan="16">5V
Max:7mA</td><td rowspan="2">general-purpose “0”,”1” Input / or Manual Pulse Generator (AB) Input</td></tr>
<tr><td>1</td></tr>
<tr><td>2</td><td rowspan="14">General-purpose Input</td><td rowspan="14">Functions are set by Mach3 “Config”=>”Ports and Pins” =>“Input Signals”</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
<tr><td>15</td></tr>
</table>

4.4 Output

J5

GND	GND	DC5V	DC5V	DC5V	PWM	S+	S-	0	1	2	3	4	5	6	7

Pin Name	Function	Electrical	Description
GND	GND	GND	Signal Ground
GND			
DC5V	5V DC output	Max=120mA	On-board isolated power module output
DC5V			
DC5V			
PWM	Pulse-Width Modulation	OC，12V/13mA	Spindle speed Control (Output)
S+	LED Positive input	6mA	Spindle speed Measure (Input)
S-	LED Negative input		
0	8 general-purpose (open-drain) output channels	Max=24V /500mA OC (open-drain)	Functions are set by Mach3 ”Config”=>”Ports and Pins” => “Output Signals”
1			
2			
3			
4			
5			
6			
7			



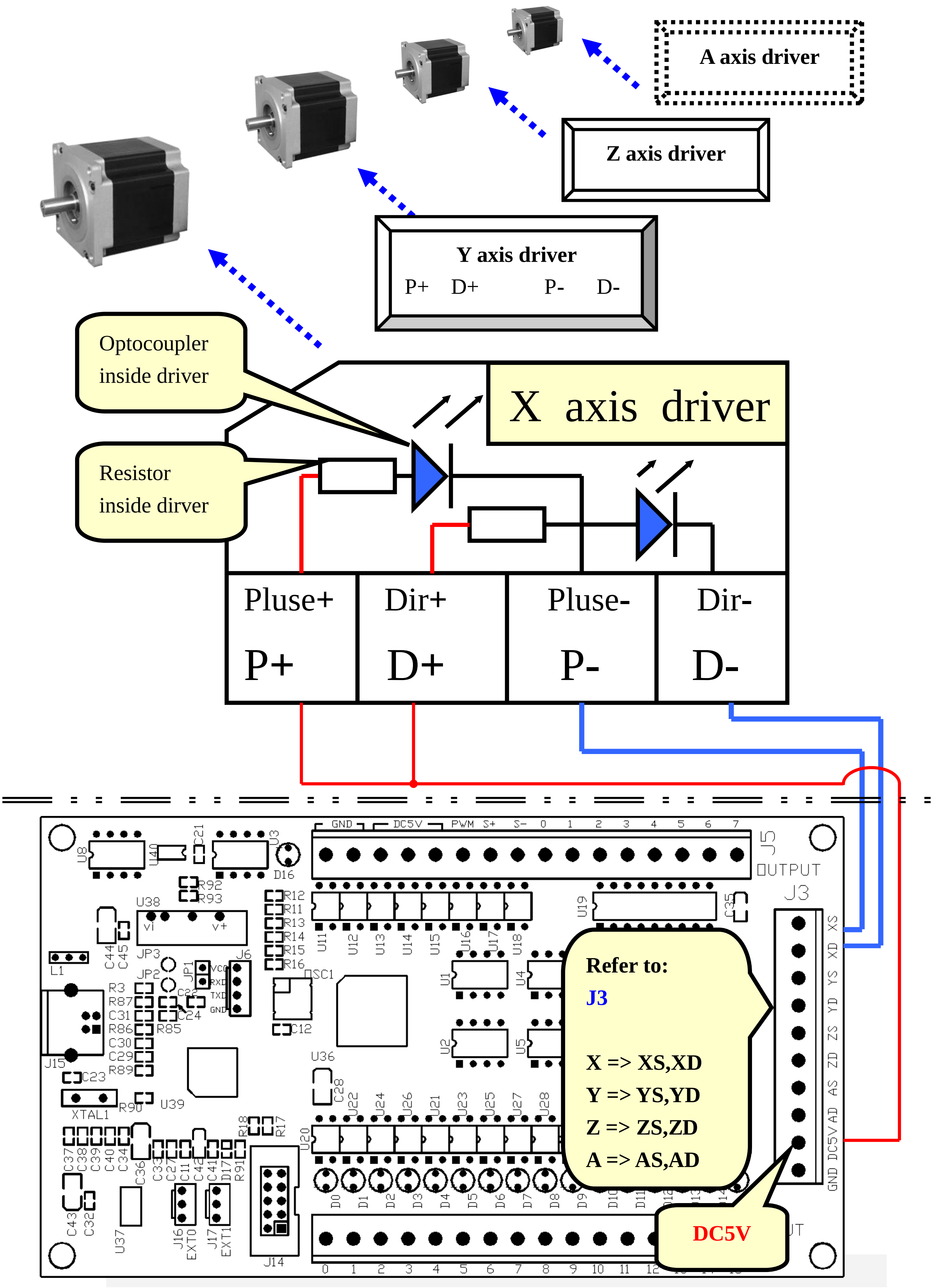
Note:
1. “DC5V” is on-board isolated power module output. Voltage:5V, max current **120mA**.
2. “ OC “: open-drain output

5 Motion card connection Diagram

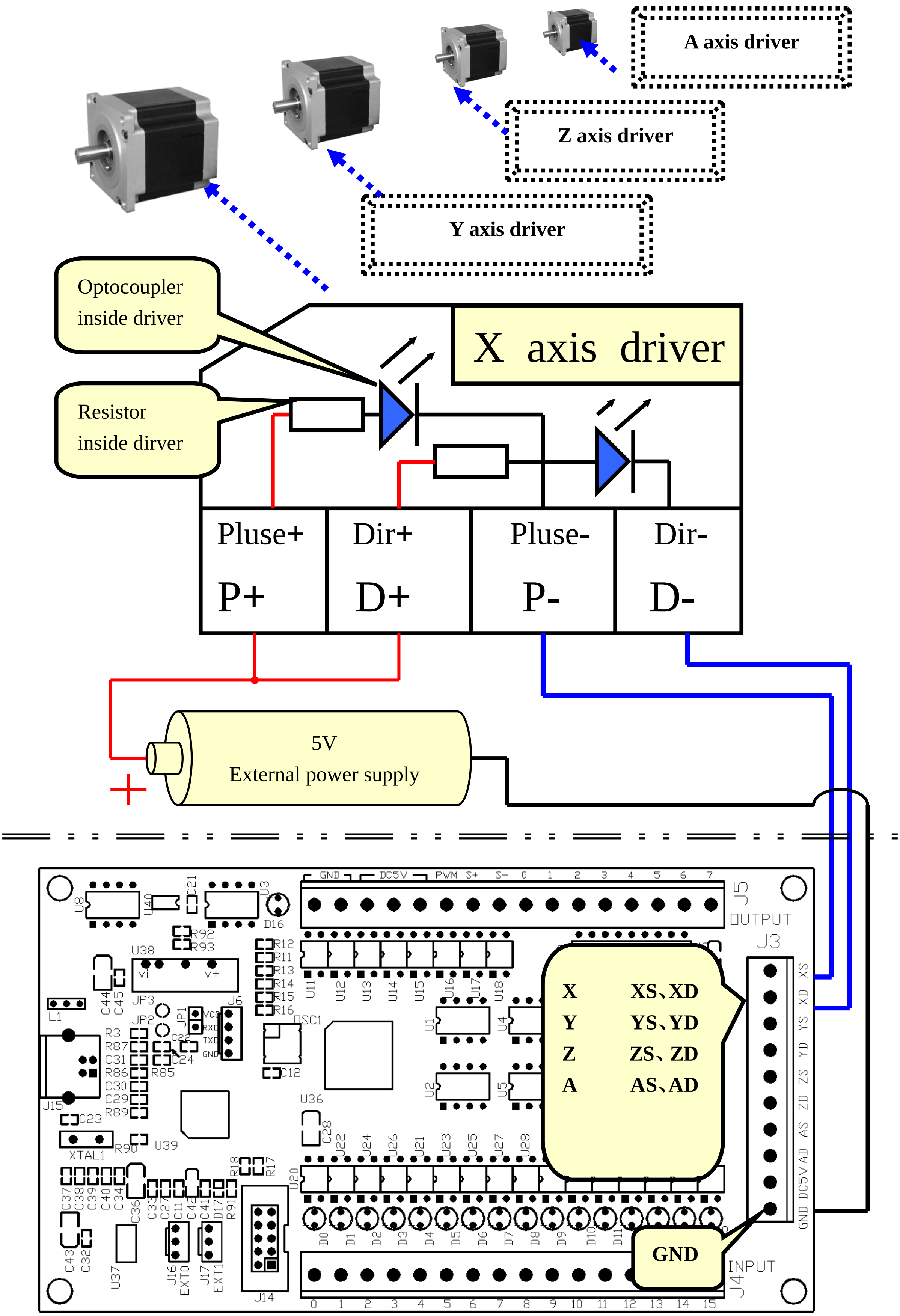
5.1 X、Y、Z、A axes output. Optical power supply: Internal(on board) or External.

5.1.1 Using Internal(on board) power supply to drive.

Please install suitable resistance according to your setpping/servo driver need.



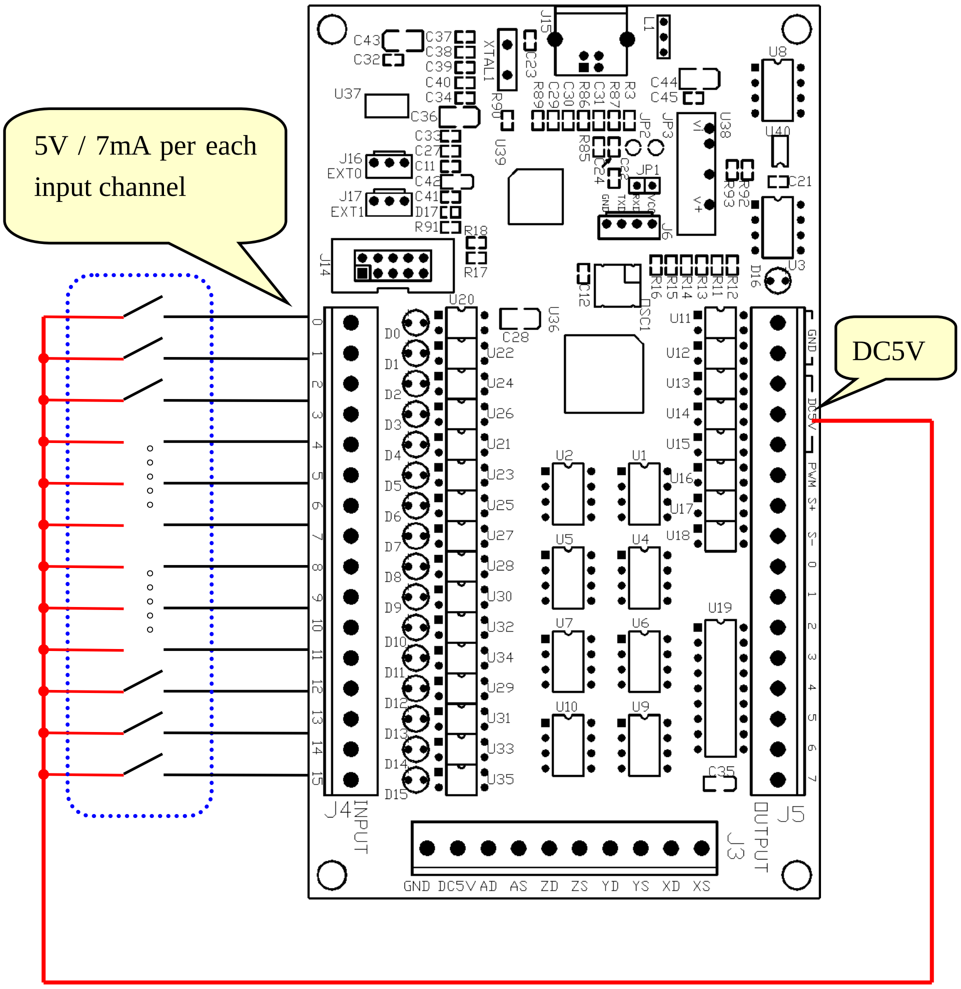
5.1.2 Using External power supply to drive.
Please install suitable resistance according to your setpping/servo driver need.



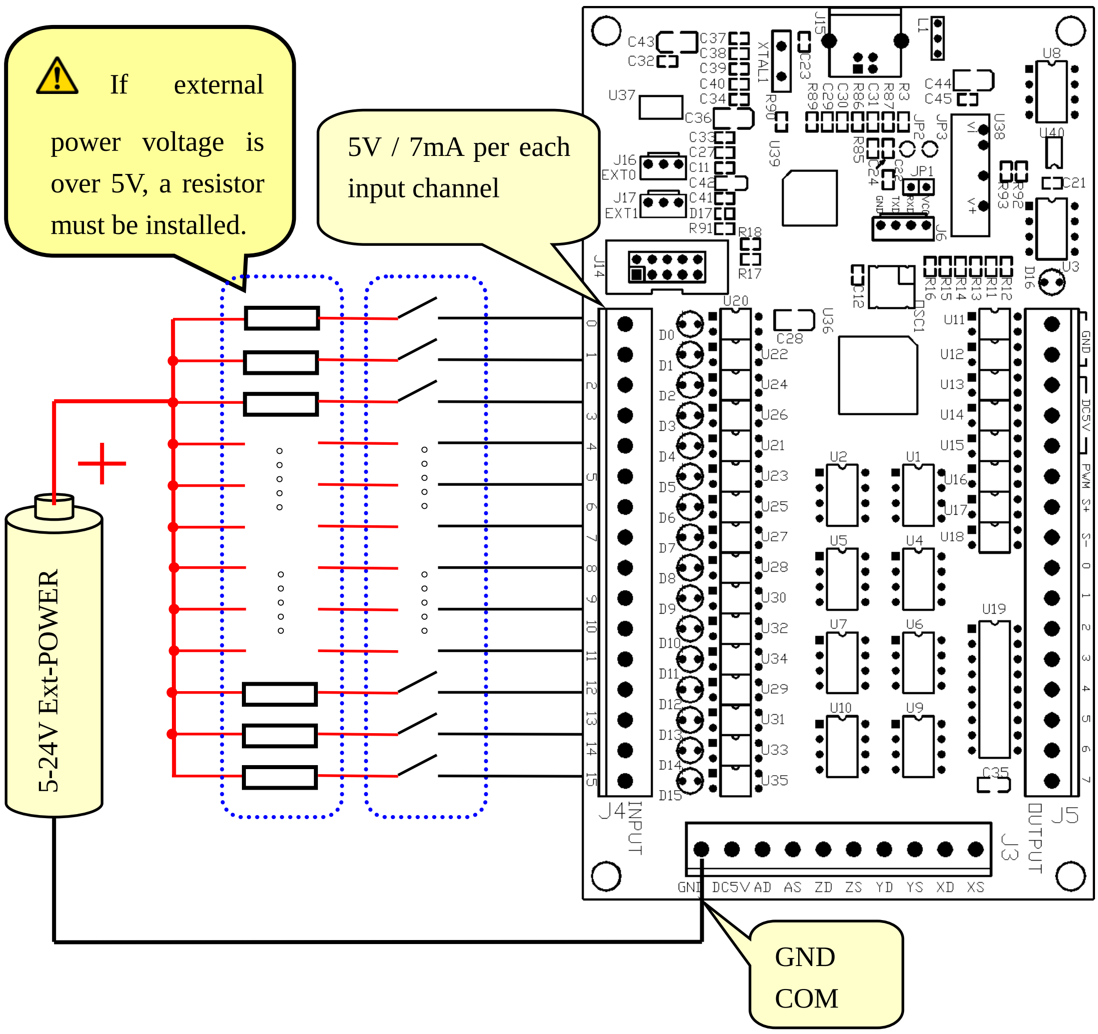
5.2 Input Channels:

There are two methods of voltage power supply: Internal or External

5.2.1 Internal voltage power supply



5.2.2 External voltage power supply for input.



ATTENTION:

If the external power voltage is over 5V, a resistor must be installed between the power source and each input channel!

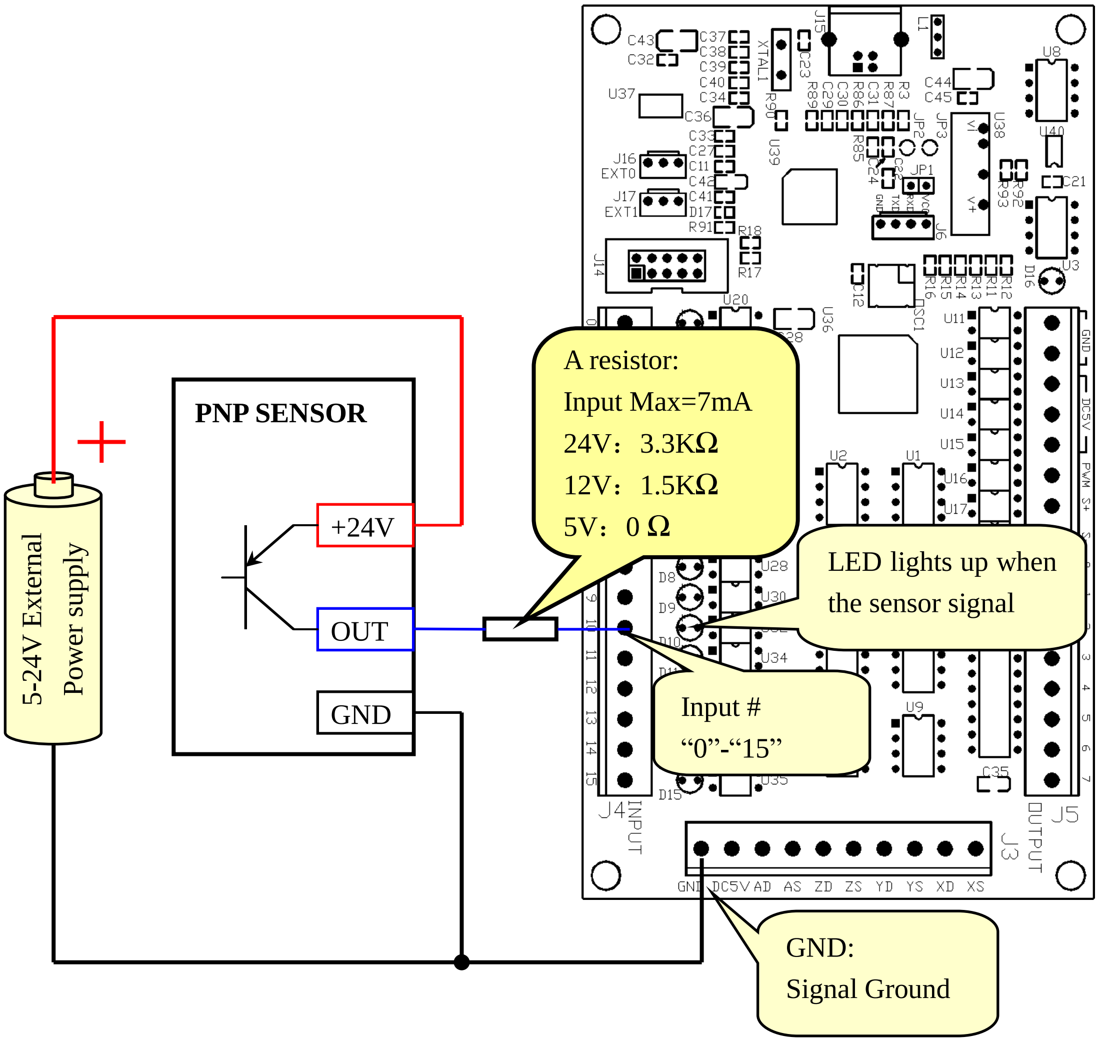
For the external power voltage is 24V, 3K Ω resistor must be used,

And for the external power voltage is 12V, 1.5K Ω resistor must be used,

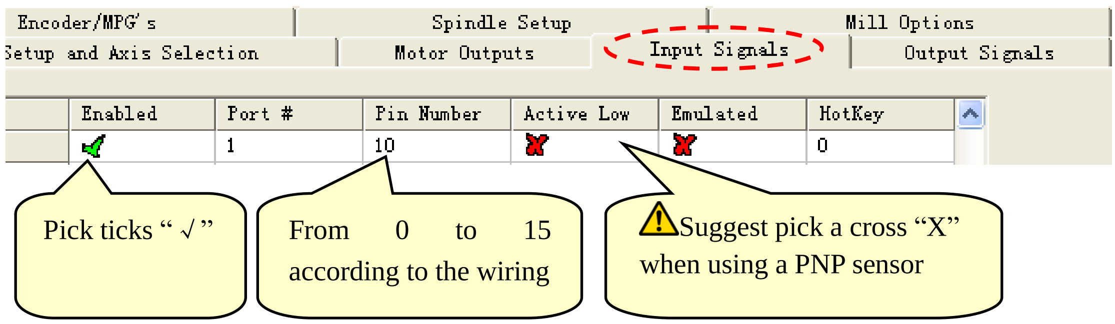
5.3 Sensor’s wiring and setting

5.3.1 PNP sensor

⚠ Use the external power supply for the sensor!

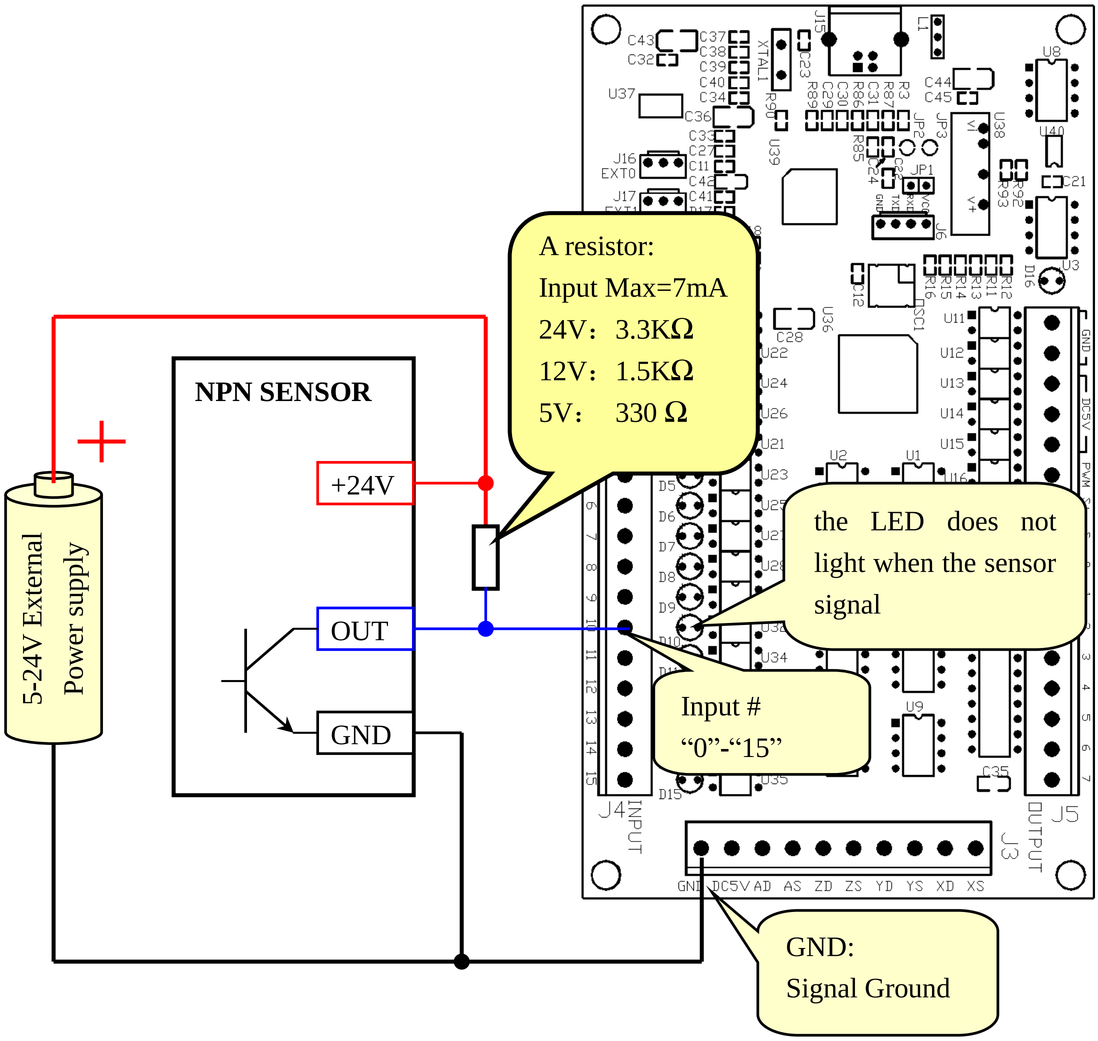


Mach3 Input Signals Setting



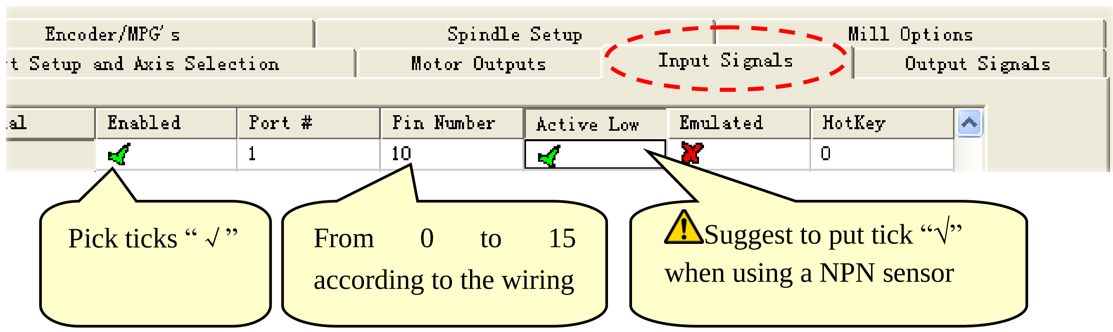
5.3.2 NPN sensor

⚠ Use the external power supply for the sensor!



⚠

Mach3 Input Signals Setting

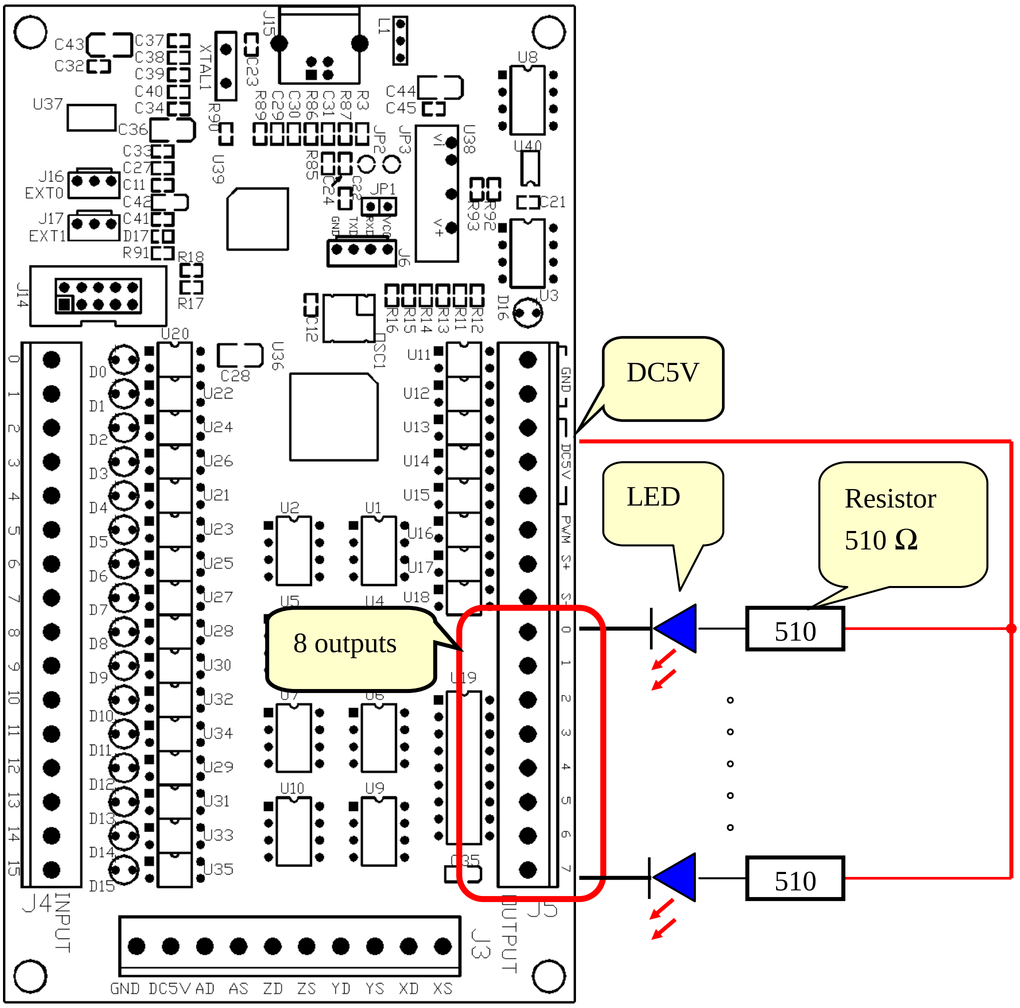


5.4 output: 8-general-outputs,

Maximum Load voltage=24V / current=500mA, When output Low (turn on), otherwise the output is high-impedancestate (Hi-Z).

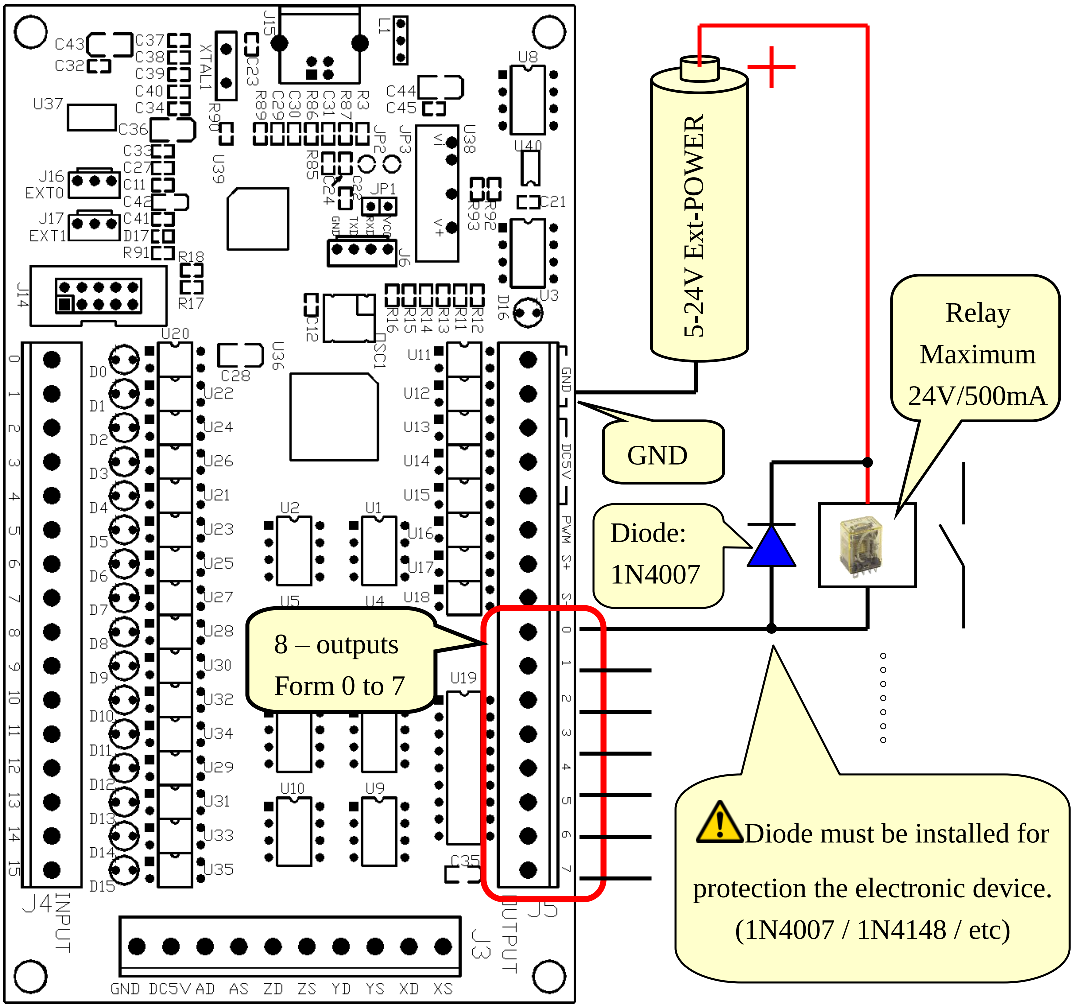
5.4.1 Drive LED with Internal(On-board) power

When drive tiny current loads like LED, driver enable signal etc, internal (on-board) power supply can be used directly.



5.4.2 Drive 500mA relay by 5-24V external power supply

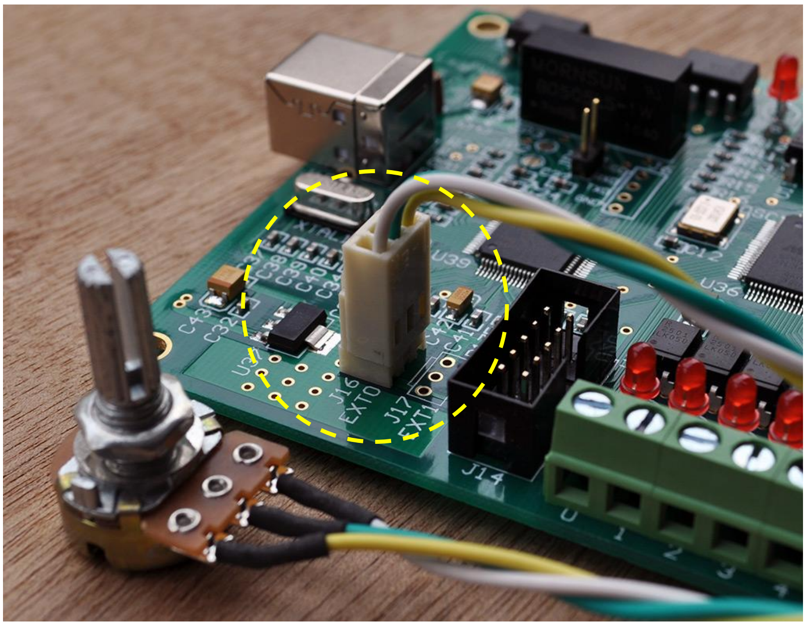
Drver high loading devices, must use external power supply



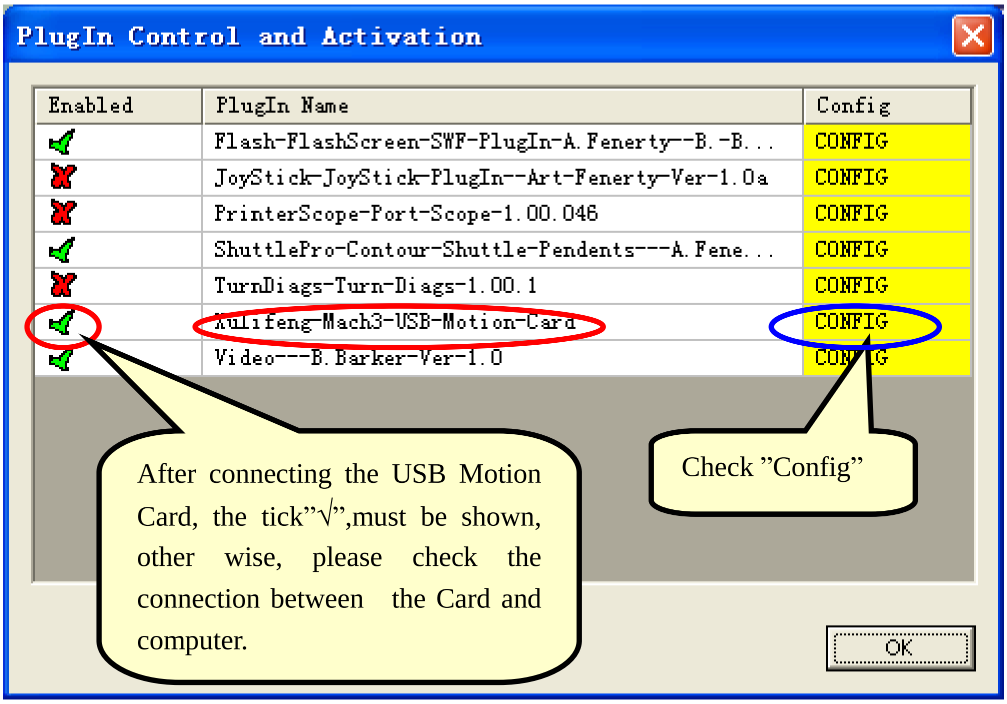
6 Adjustment-knob

6.1 Please complete the step in Chapter 1 (Prepare).

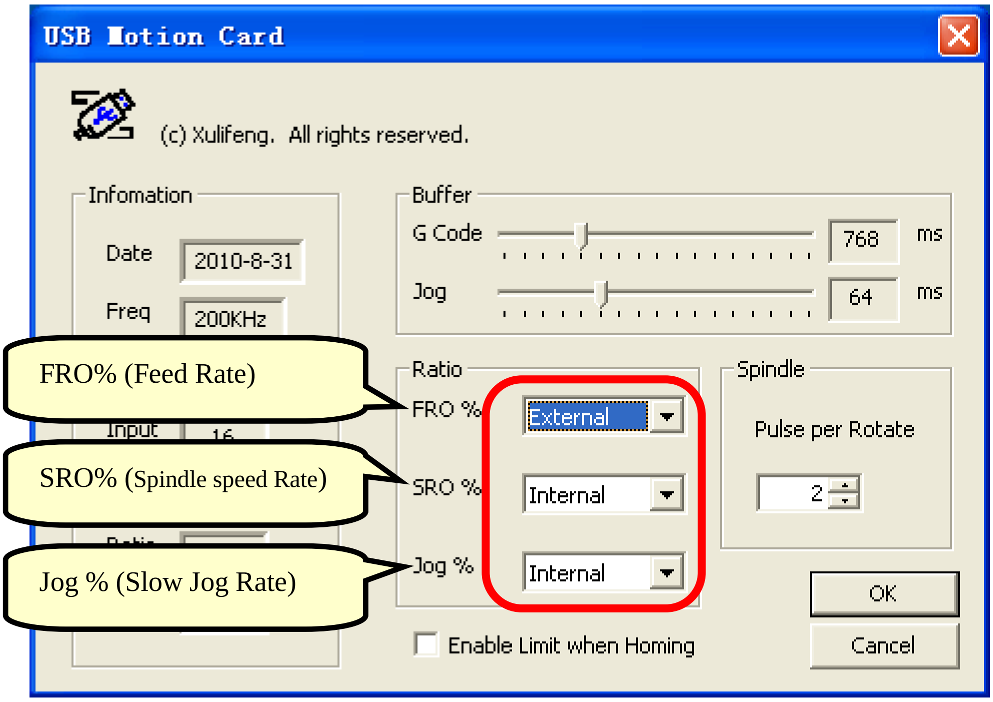
6.2 Connecting the adjustment-knob with the EXT0(J16) of USB Motion Card.



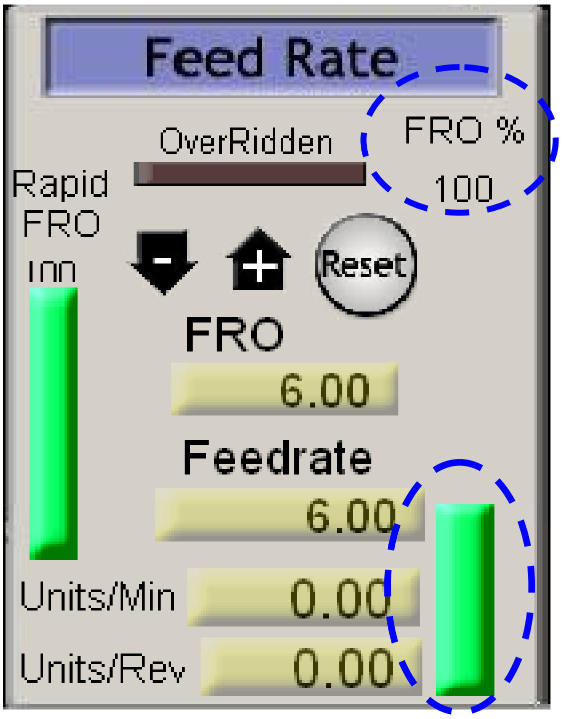
6.3 Go to “Config Plugins” under “Config” to go into “PlugIn Control and Activation”.

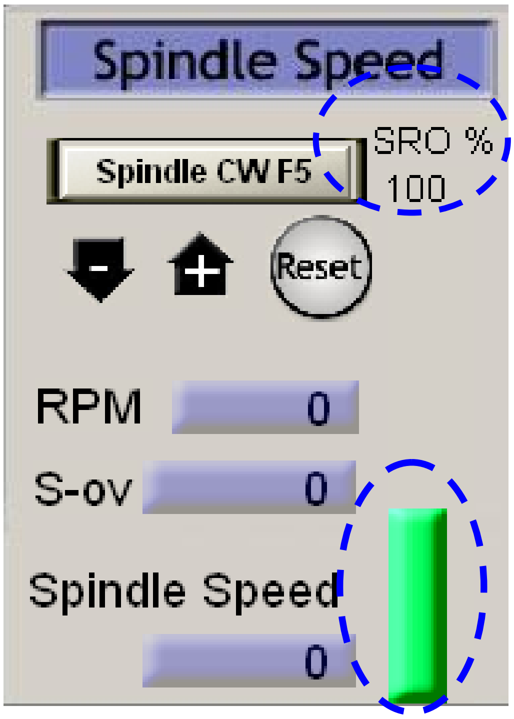


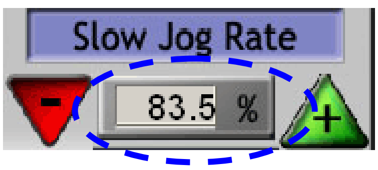
6.4 After check the “Config”, USB Motion Card setting will be shown. You can select one of the functions which is able to controlled by the external knob. Please select “External 0” in your particular setting. Then, click “OK” to exit.



6.5 Now, you can try to turn the knob to adjust your selected function.



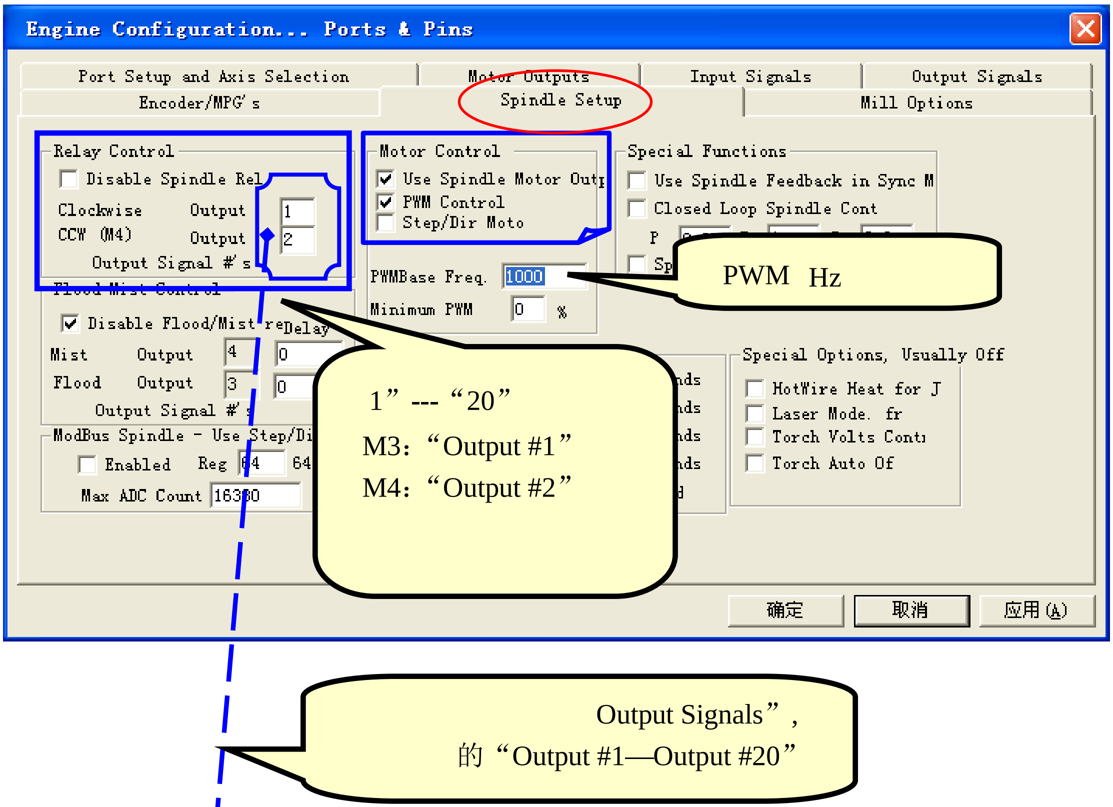




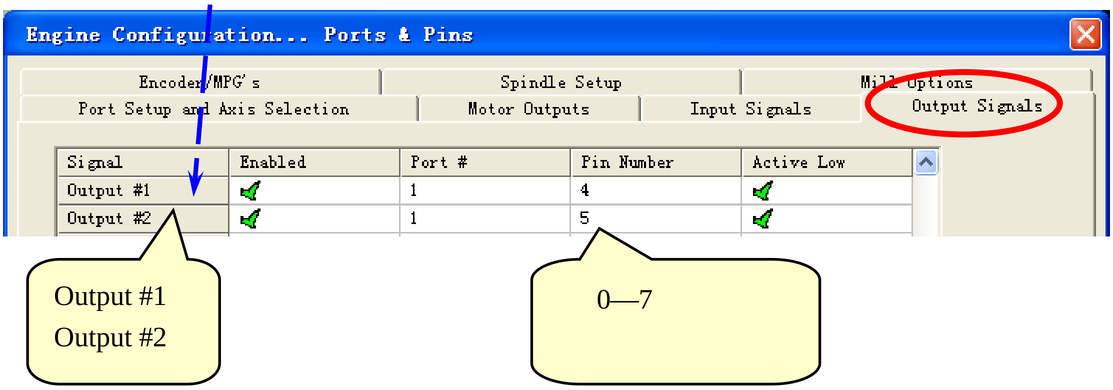
7

7.1

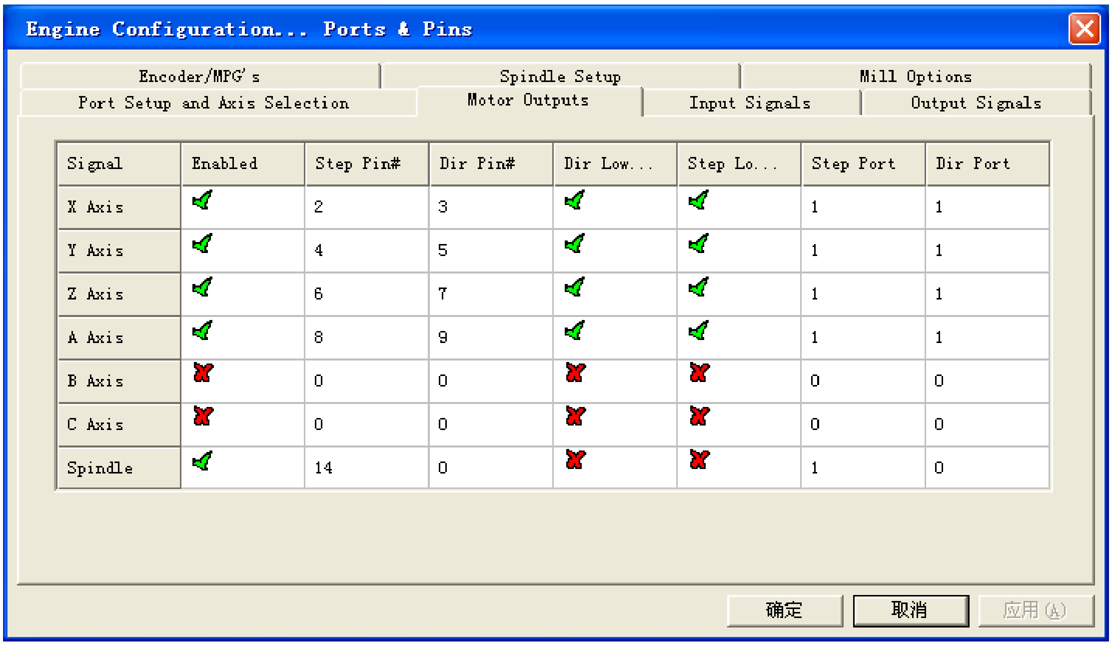
7.1.1 Spindle Setup



7.1.2

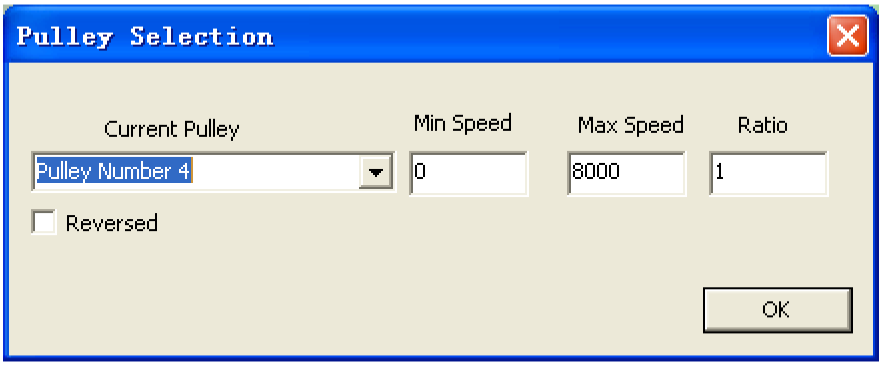


7.1.3 PWM



Signal	Enabled	Step Pin#	Dir Pin#	Dir Low...	Step Lo...	Step Port	Dir Port
X Axis	✓	2	3	✓	✓	1	1
Y Axis	✓	4	5	✓	✓	1	1
Z Axis	✓	6	7	✓	✓	1	1
A Axis	✓	8	9	✓	✓	1	1
B Axis	✗	0	0	✗	✗	0	0
C Axis	✗	0	0	✗	✗	0	0
Spindle	✓	14	0	✗	✗	1	0

7.1.4 Mach3 ”Config=>Spindle Pulleys..” ”Pulley Selection”

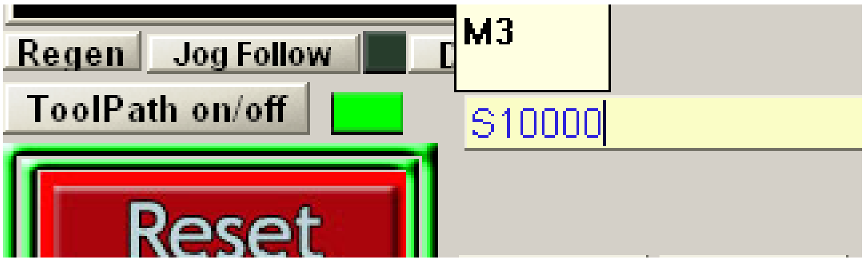


7.2

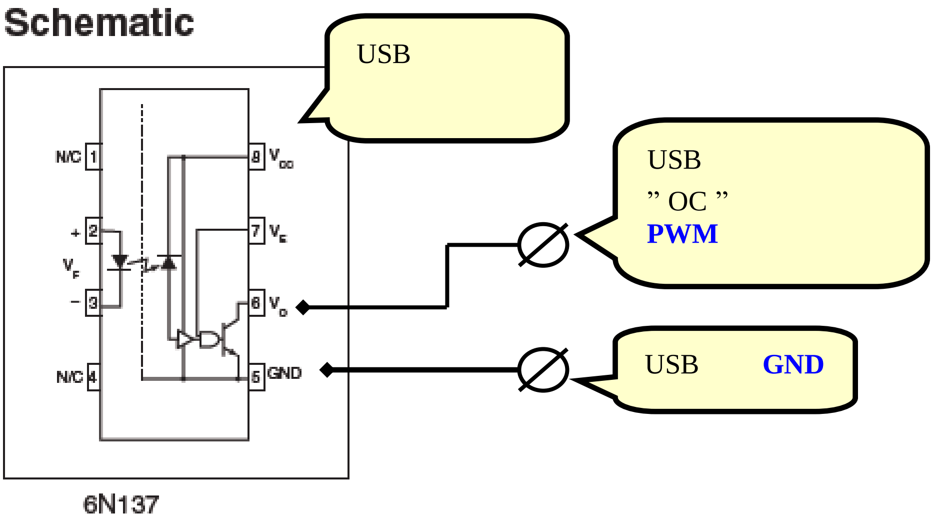
M3

S10000

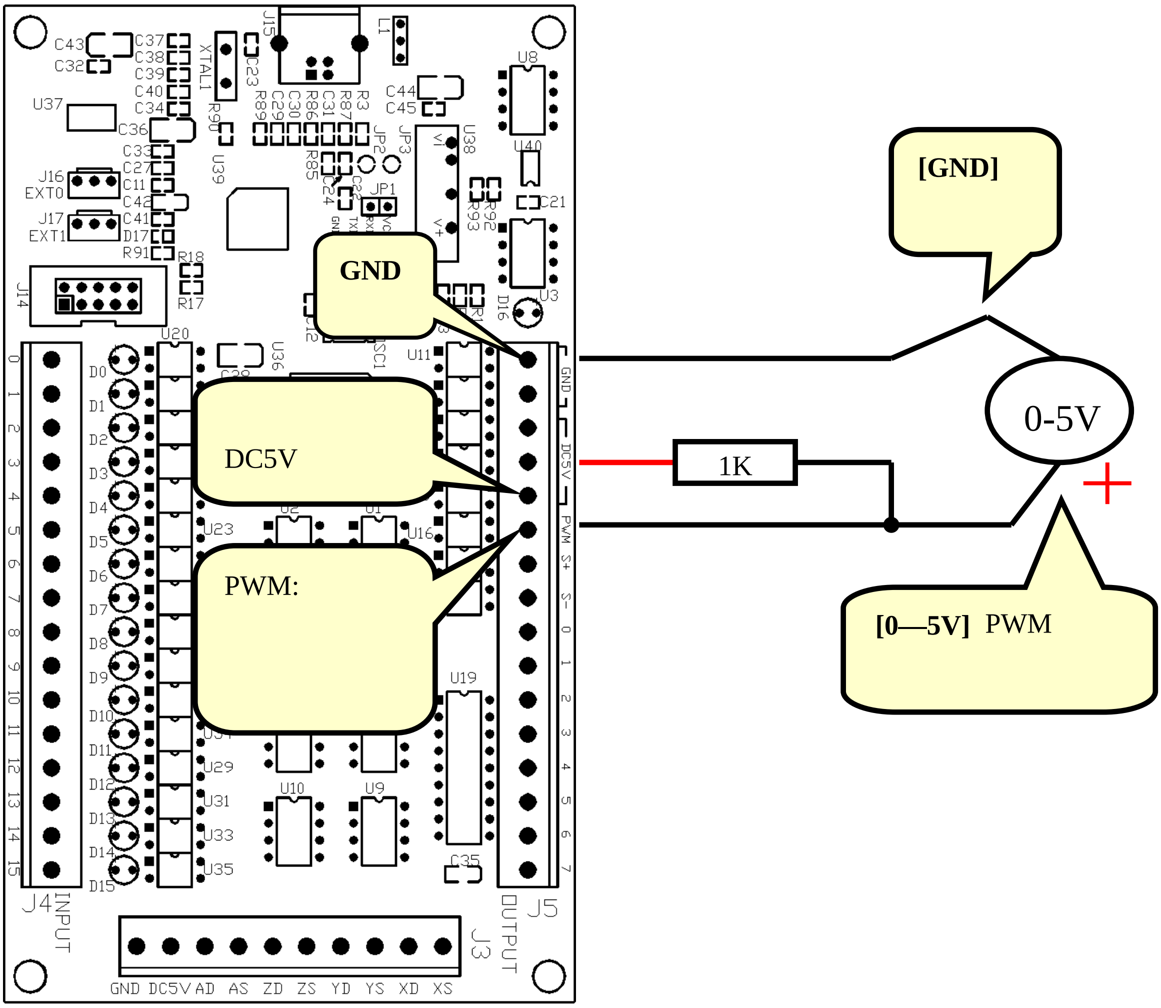
M5

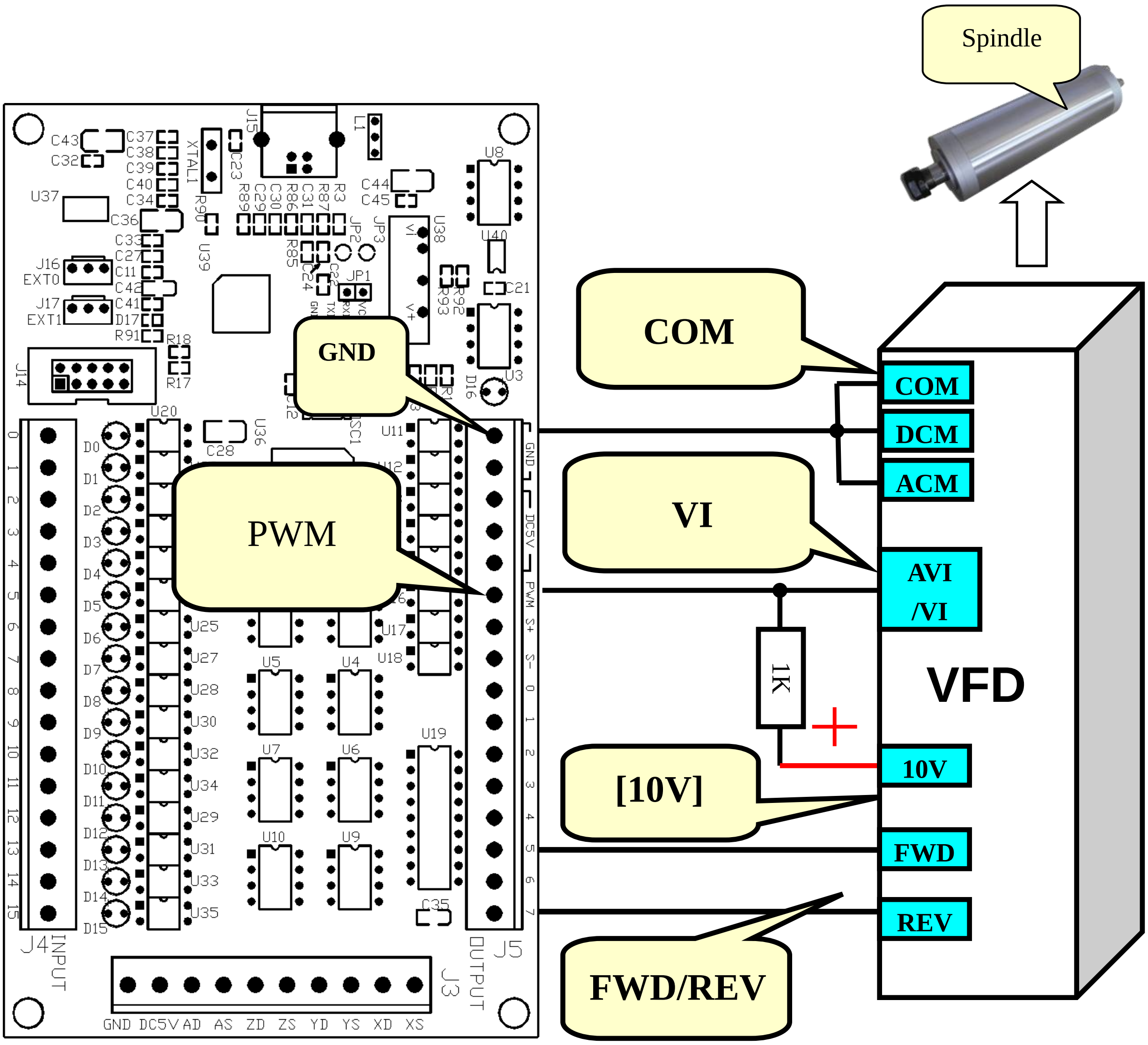


7.3



7.4 USB

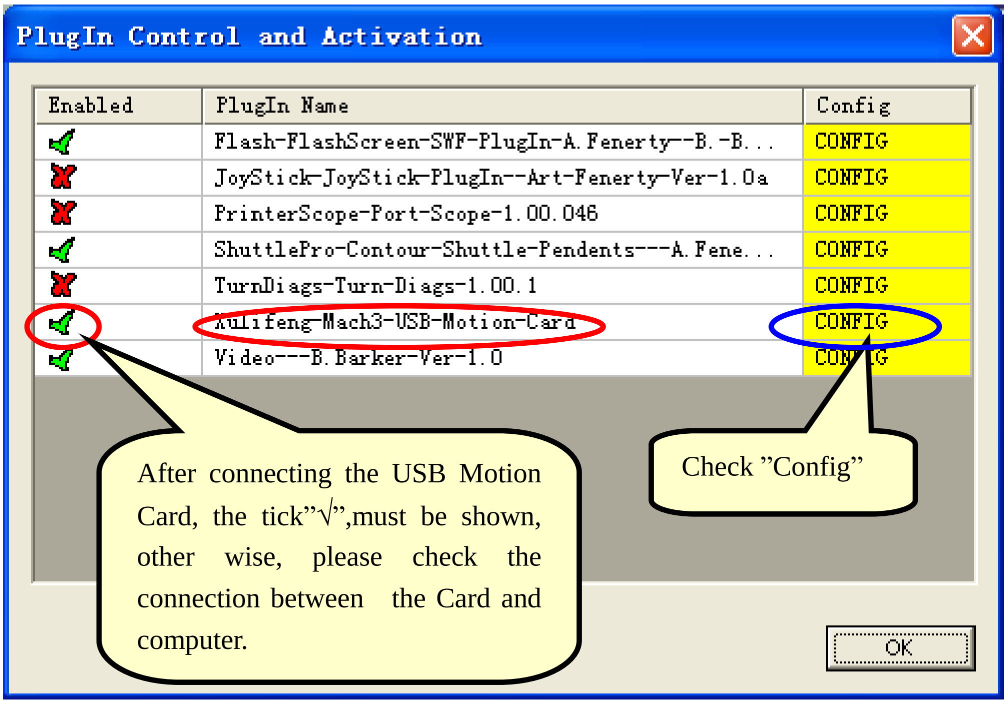

GND
DC5V
PWM:
[GND]
0-5V
1K
[0—5V] PWM
J4 INPUT
J5 OUTPUT
J3
GND DC5V AD AS ZD ZS YD YS XD XS


Spindle
COM
GND
PWM
VI
[10V]
FWD/REV
COM
DCM
ACM
AVI
/VI
VFD
1K
10V
FWD
REV
J4 INPUT
J5 OUTPUT
J3
GND DC5V AD AS ZD ZS YD YS XD XS

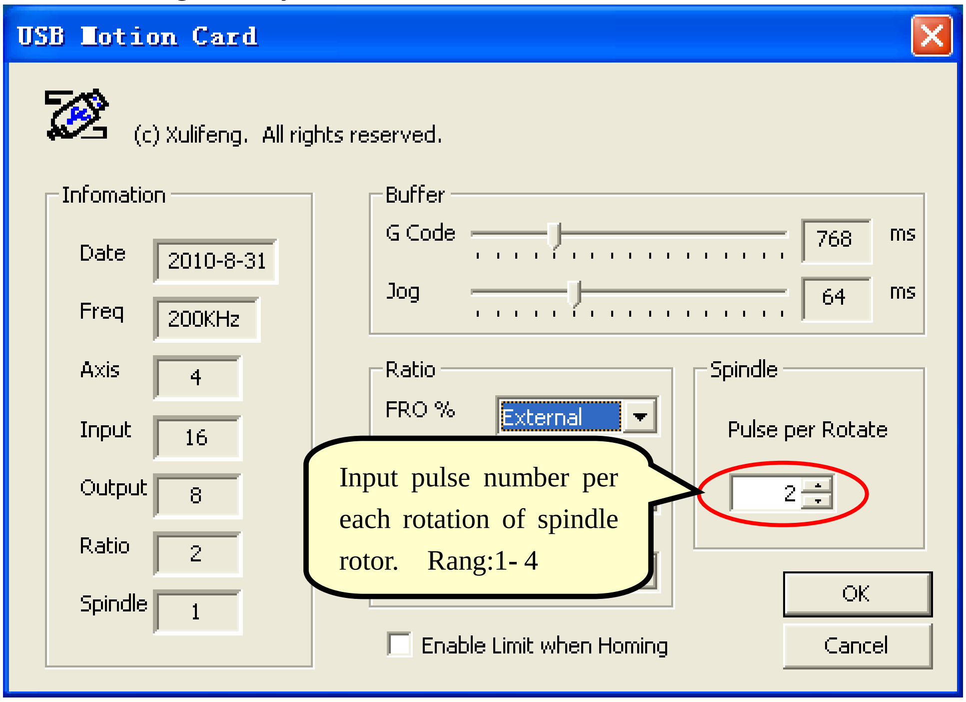
8 Measure the rotating speed of the spindle

8.1 USB Motion Card Configuration dialog

Go to “Config Plugins” under “Config” to go into “PlugIn Control and Activation”.

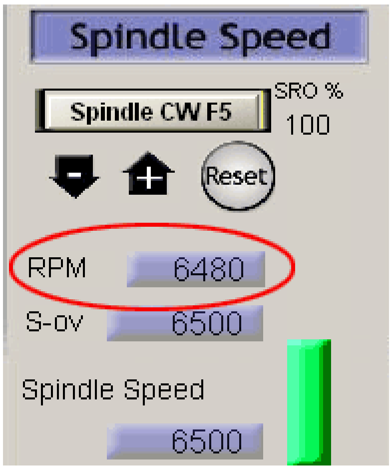


Check the “Config” to entry the “USB Motion Card”

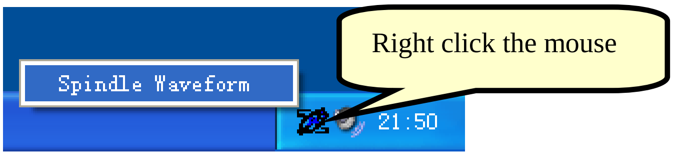


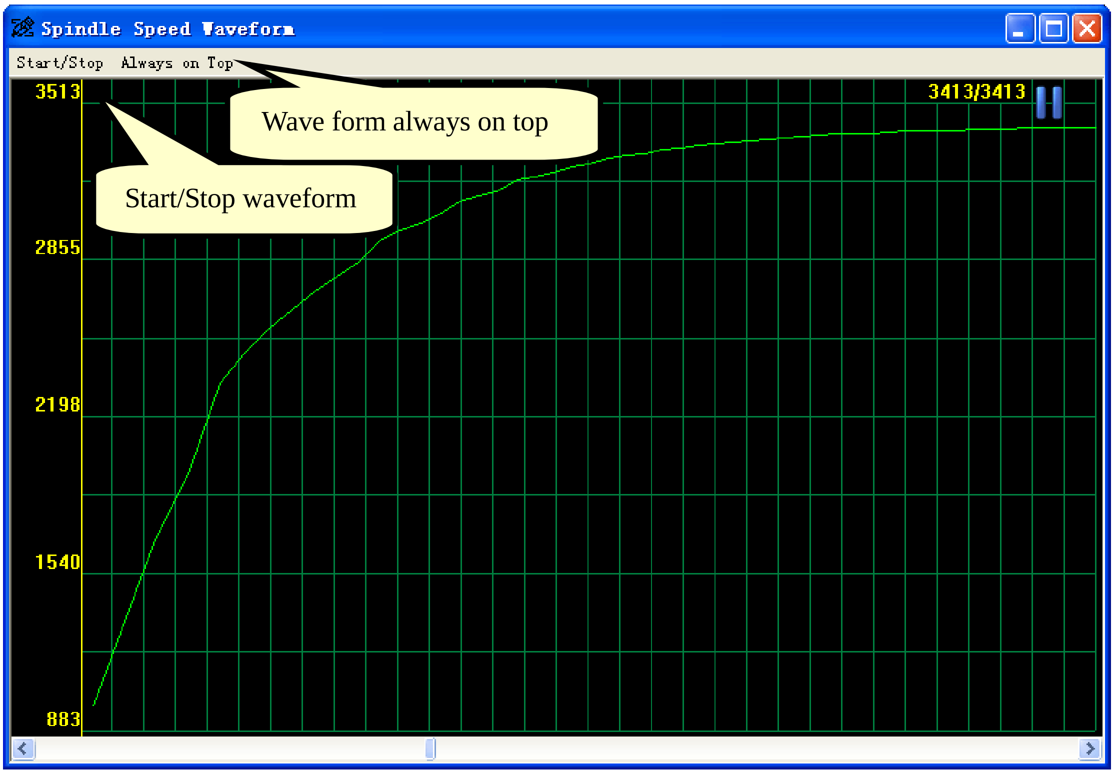
8.2 Show Spindle Speed

Measured speed will be displayed in the Mach3 as shown below



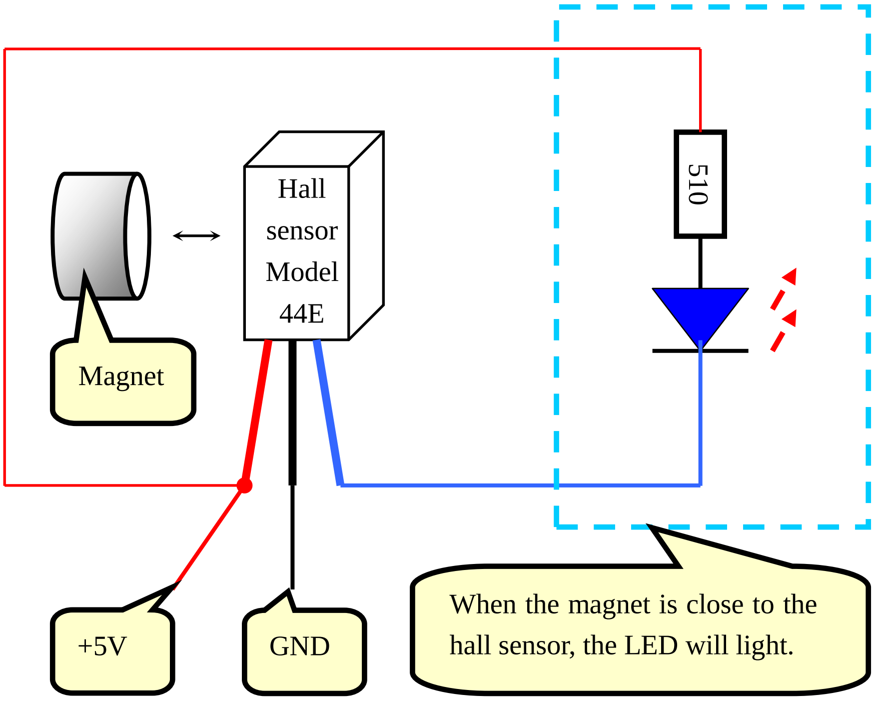
In addition, you can open the spindle speed real-time waveform display





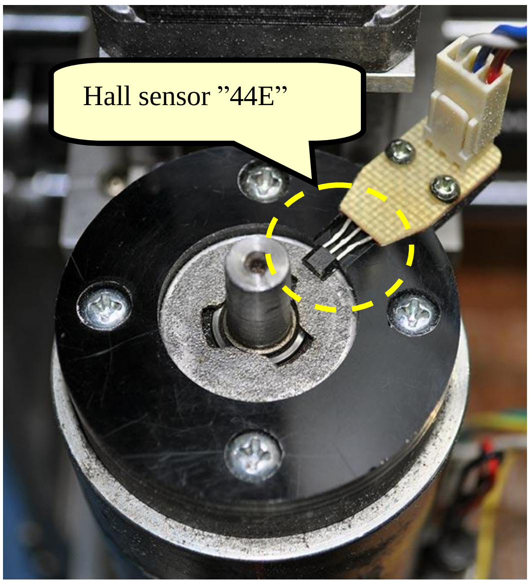
8.3 Hall sensor test circuit

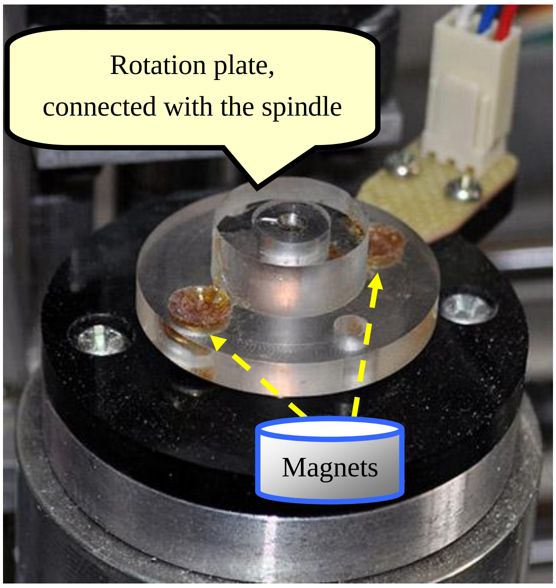
Hall sensor Model”44E”, open-drain output (OC).



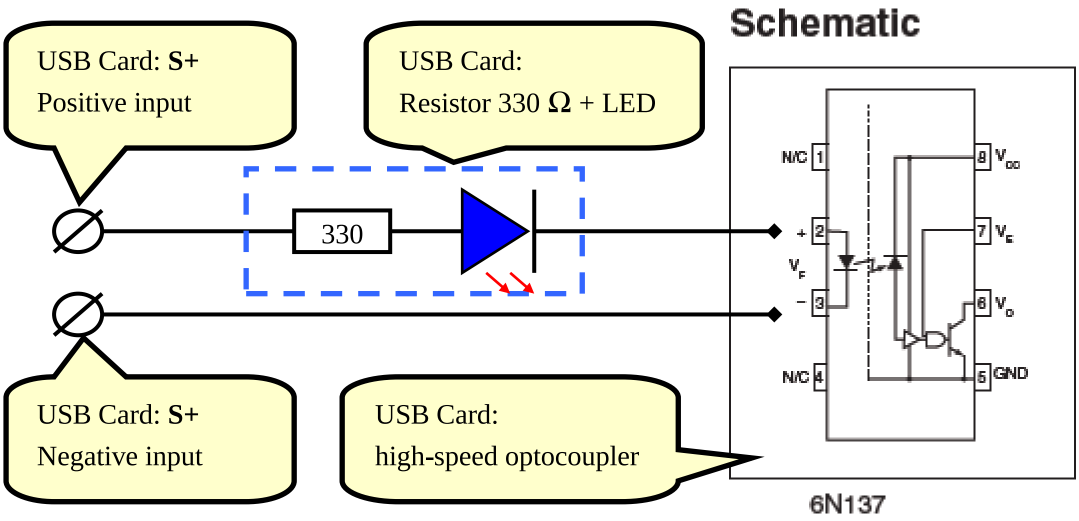
8.4 Hall sensor /Rotation plate install

Note: Be carefully about the direction of the magnetic poles of the magnet.

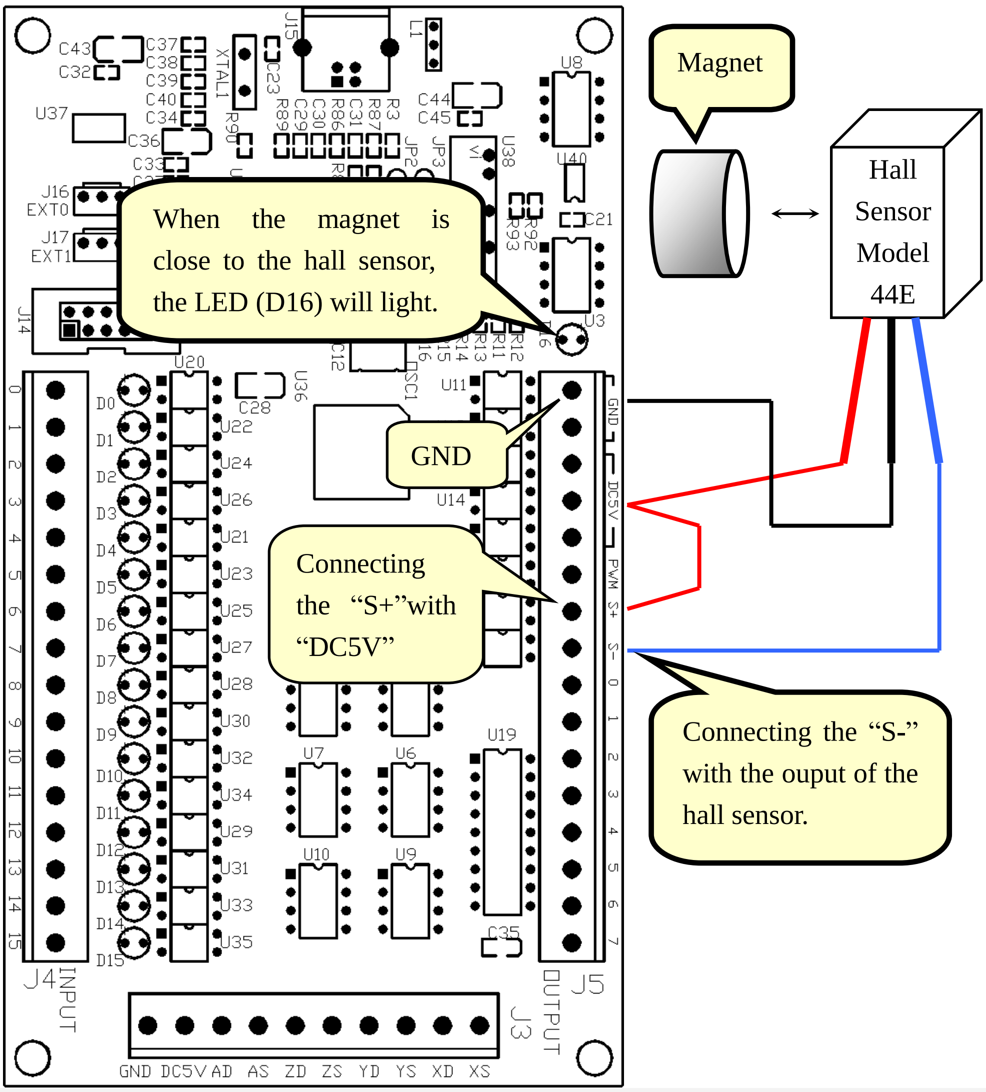




8.5 Diagram of the spindle speed sensor part of the USB Motion Card



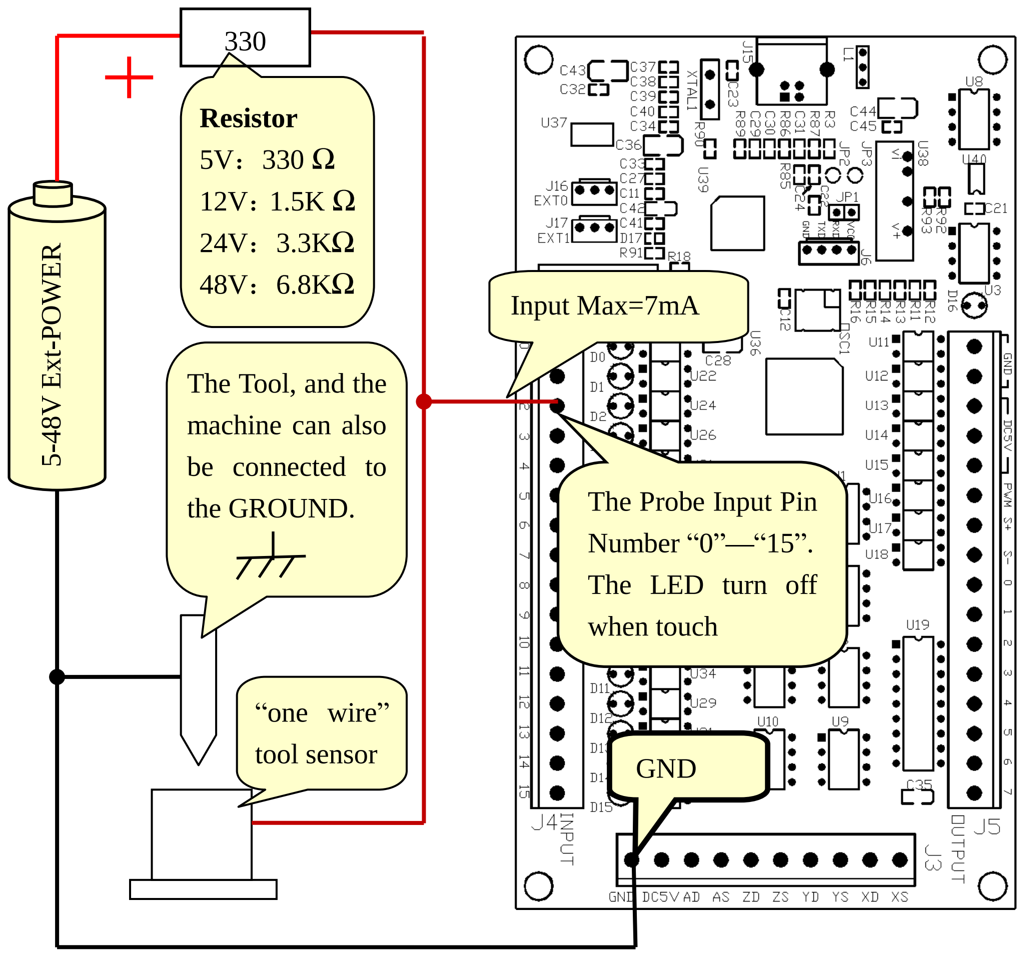
8.6 Connection Diagram of the hall sensor



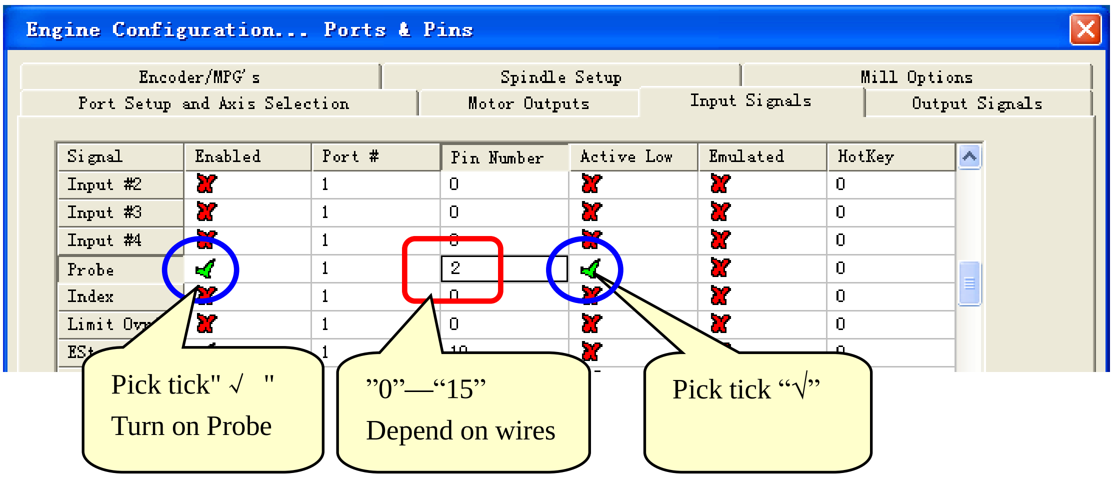
9 Auto tool zero

9.1 Tool touch sensor wires

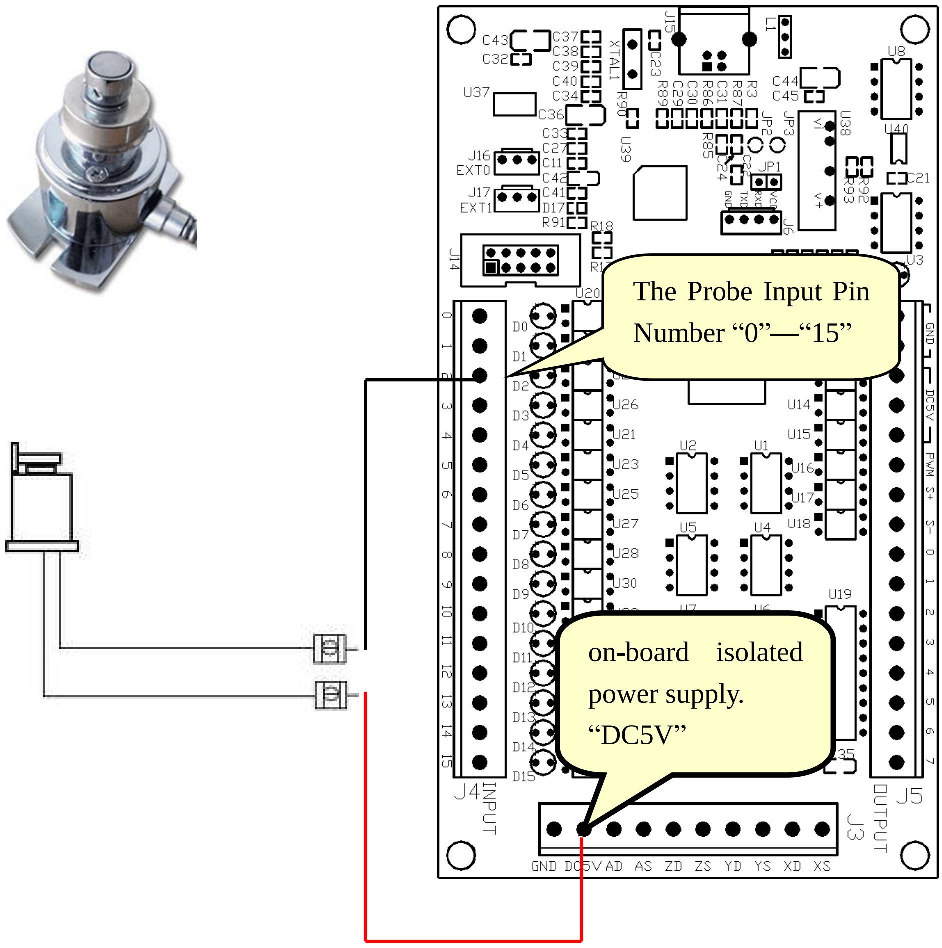
9.1.1 “one wire” simple tool touch sensor:



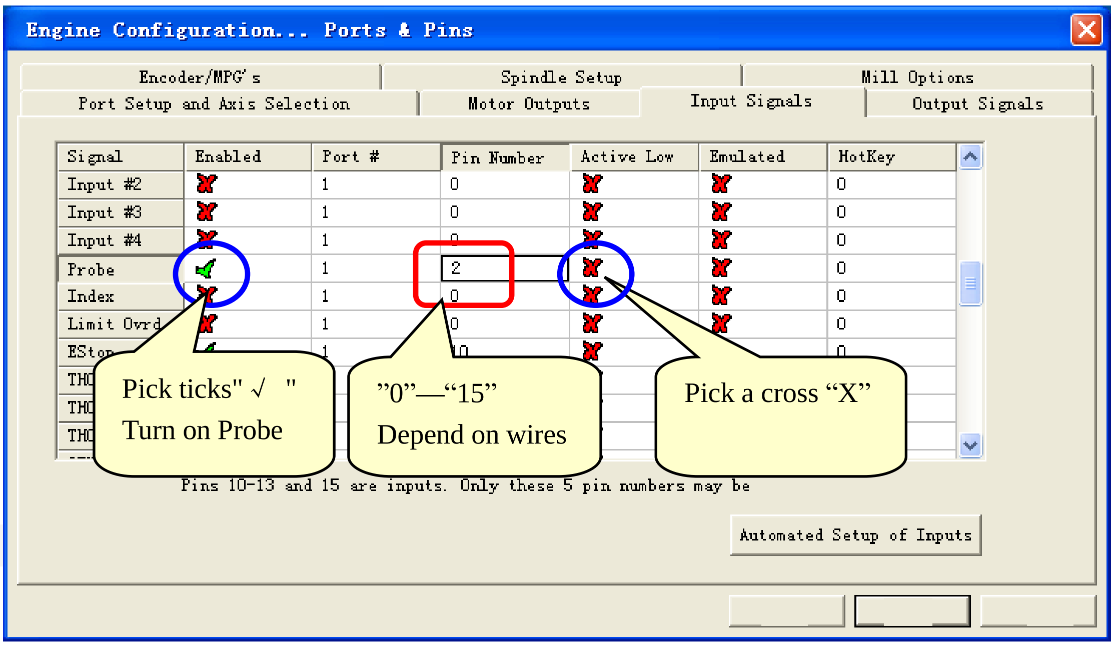
Setup Probe input signal, as shown below: (Config => Ports and Pins)



9.1.2 “two-wire” Tool touch sensor:



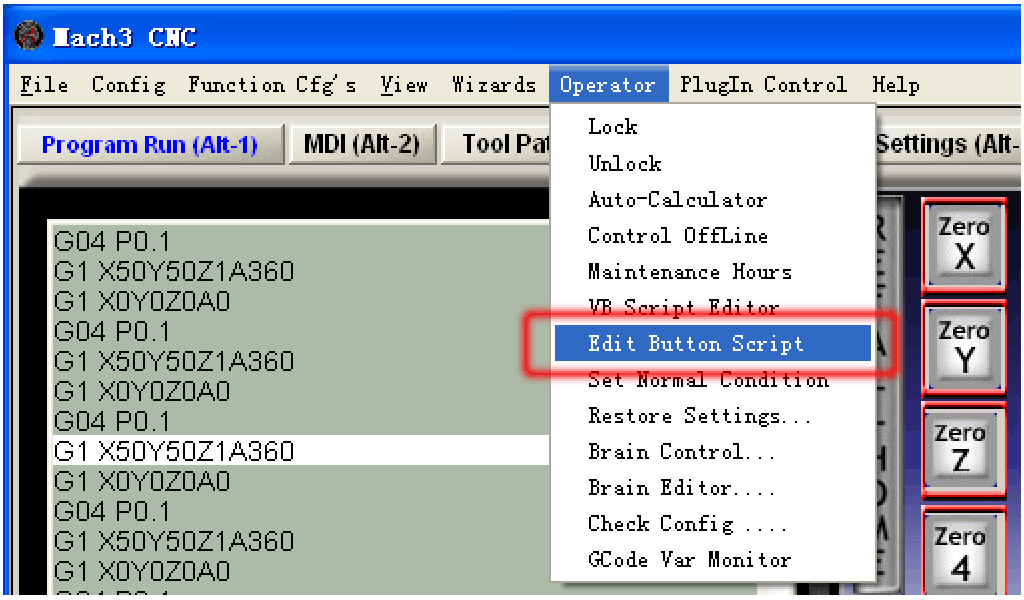
Setup Probe input signal, as shown below: (Config => Ports and Pins)



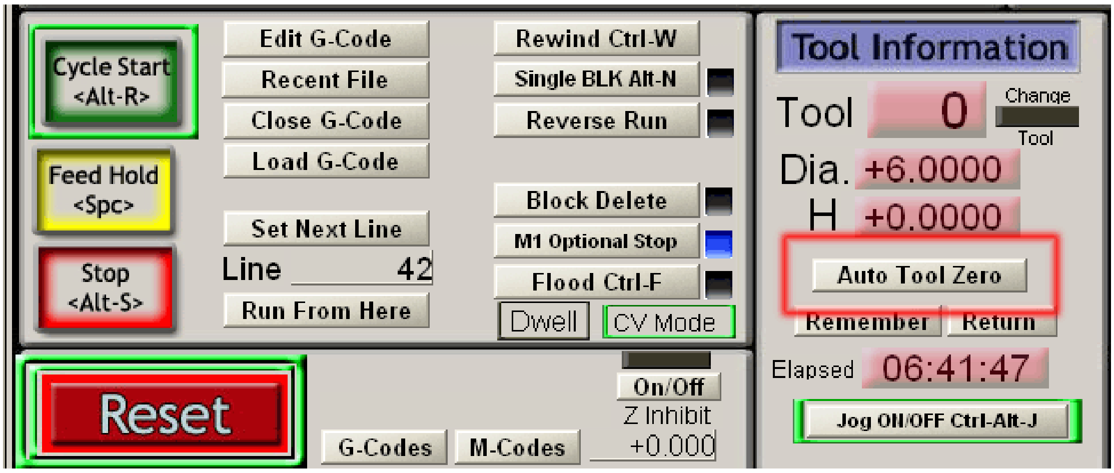
9.2 Loading the VB Script to the Auto Tool Zero Button

That Mach3 provides for customizable, user-defined button macros on some of the existing screen buttons is what makes this possible without having to do Mach3 screen designs to add new buttons. The Auto Tool Zero button on the Programs Run screen is the one used for this purpose.

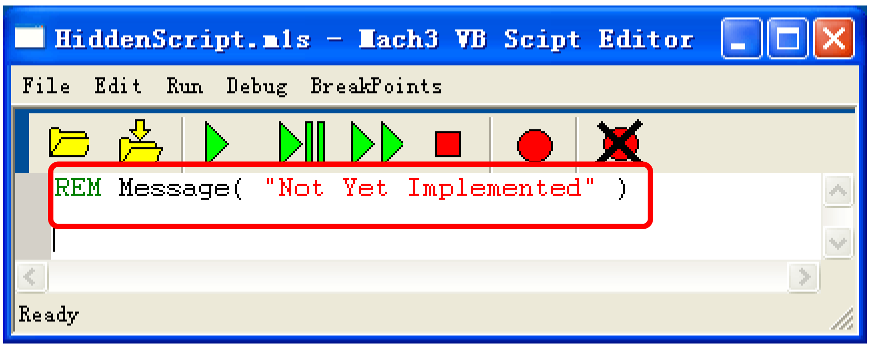
9.2.1 From the Mach3 Program Run screen, click “Operator” on the Menu bar



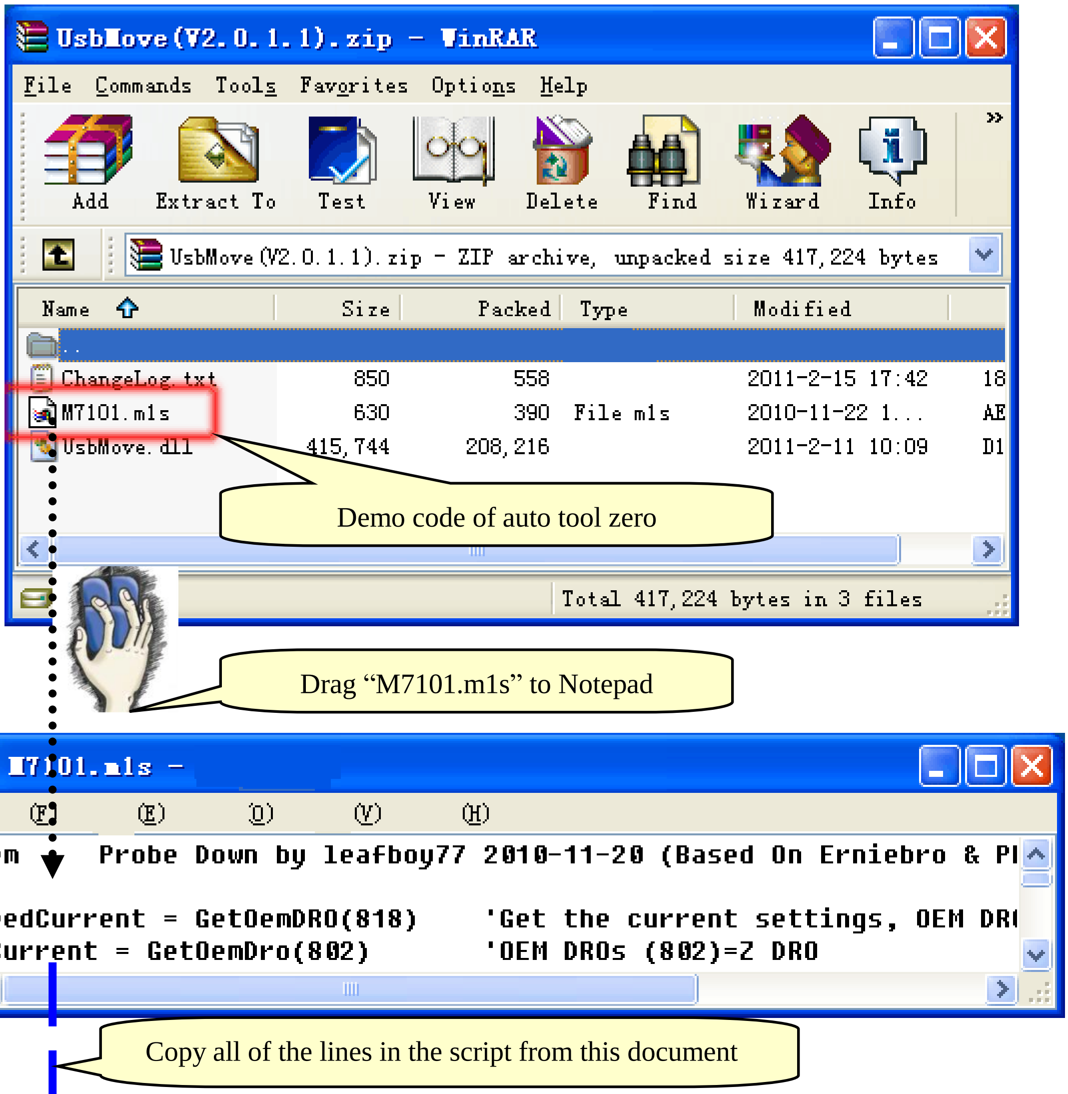
9.2.2 then click “Edit Button Script”. The buttons that are editable will start flashing.



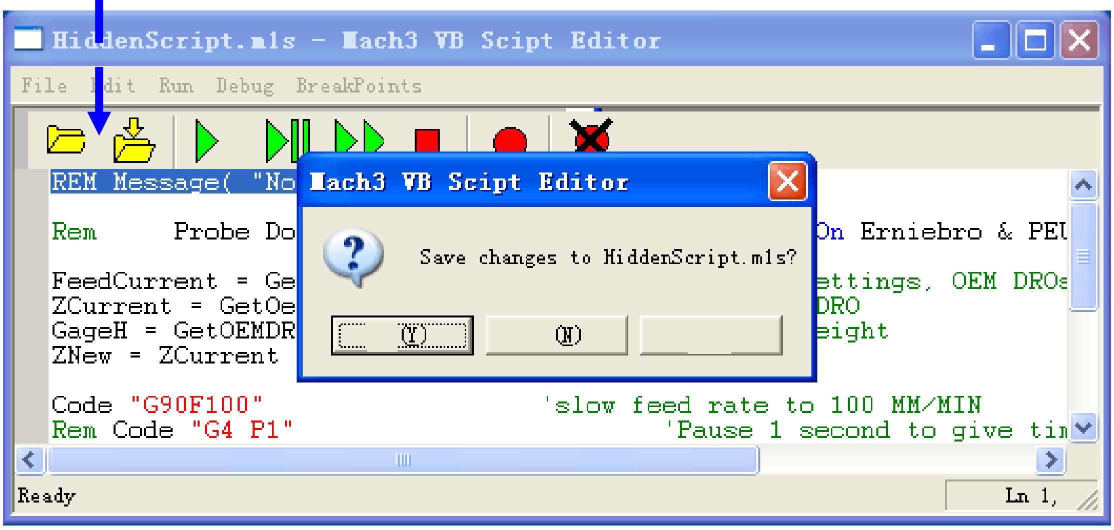
9.2.3 click the flashing Auto Tool Zero button. The Mach3 VB Script Editor window will open. By default this file will always be named "HiddenScript.m1s and at first there is one line of code in the edit window that may have a “Not Implemented” message in it.



9.2.4 Click any where in the edit window's white space. Highlight any lines by typing Ctrl+A and press the Delete key or click Edit > Select All > press Delete key.



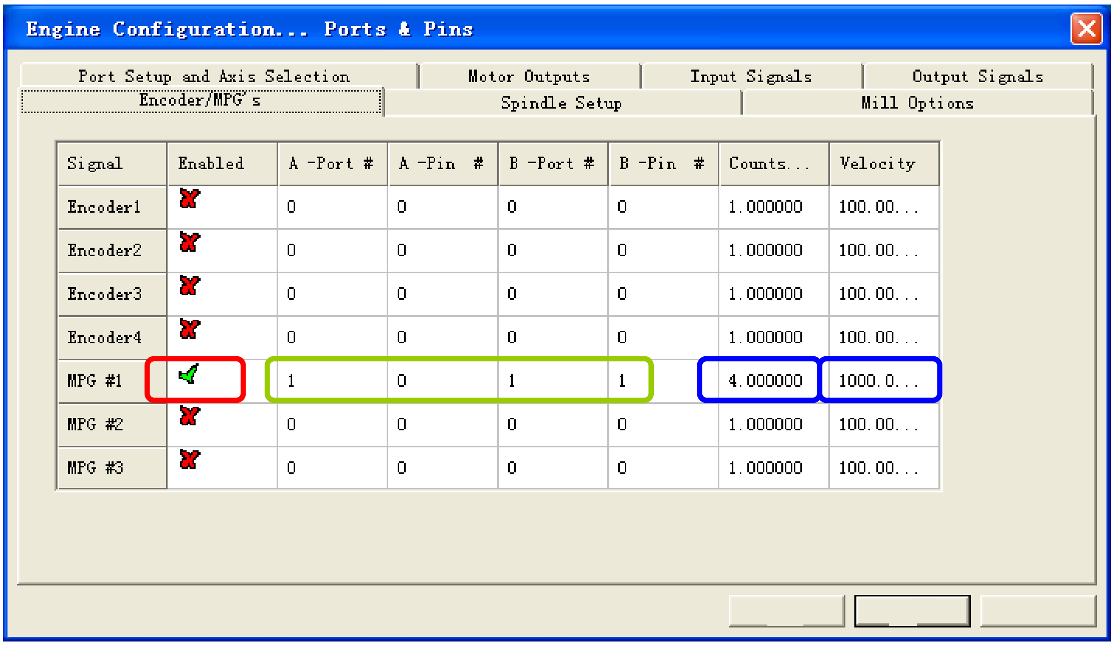
Paste them into the VB Script Editor window then click File > Save.



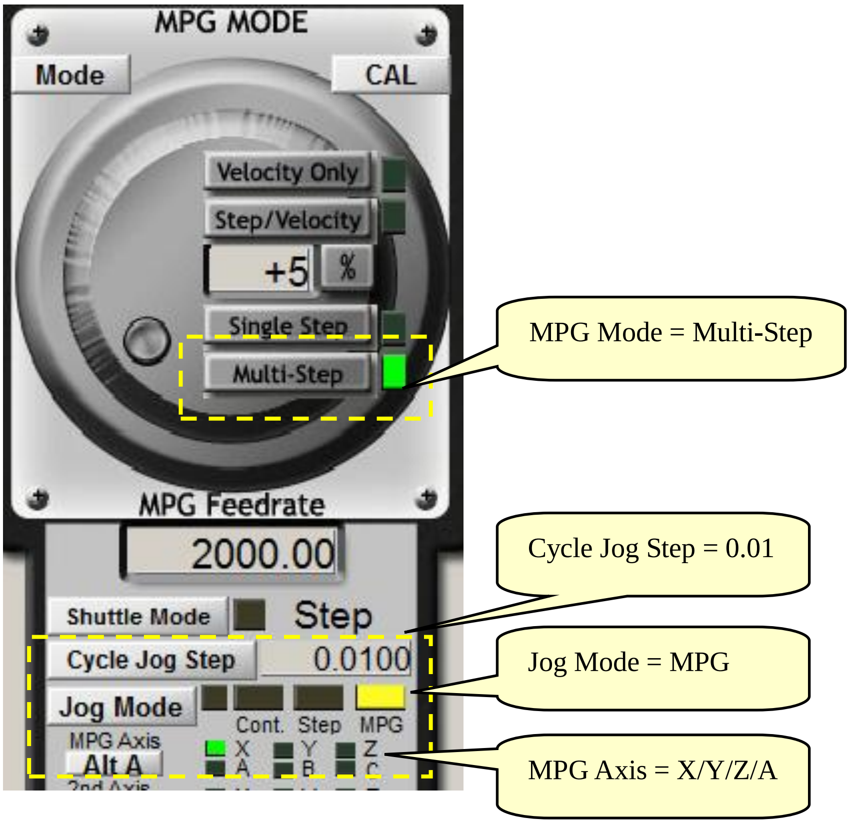
9.2.5 Note: http://buildyourtools.com/phpBB3/viewtopic.php?f=5&t=985

10.2

10.2.1 Mach3 (Config => Ports and Pins)

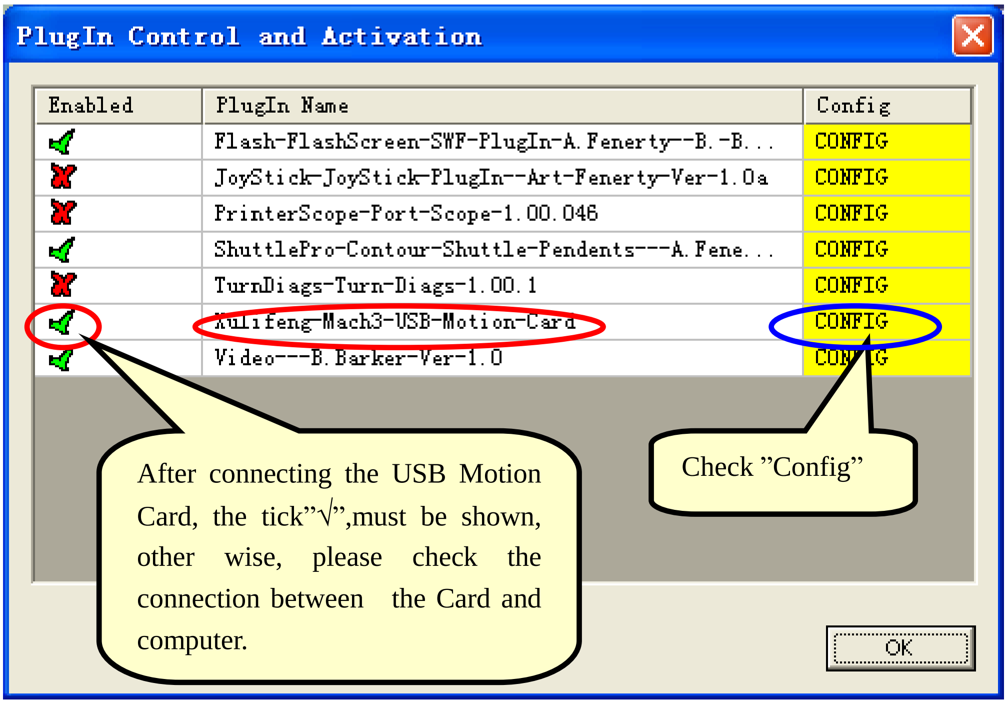


10.2.2 "TAB"



11 Read-ahead buffer setting

11.1 Go to “Config Plugins” under “Config” to go into “PlugIn Control and Activation”.



11.2 In accordance with the performance of a PC, set the read-ahead buffer. Adjust the buffer time to run smoothly.

